Australian Government
Productivity Commission

Public and Private Hospitals

Productivity Commission Research Report

December 2009

ISBN 978-1-74037-297-8

This publication is available in hard copy or PDF format from the Productivity Commission website at www.pc.gov.au. If you require part or all of this publication in a different format, please contact Media and Publications (see below).

Publications Inquiries:
Media and Publications
Productivity Commission
Locked Bag 2 Collins Street East
Melbourne VIC 8003

Tel: (03) 9653 2244
Fax: (03) 9653 2303
Email: maps@pc.gov.au

General Inquiries:
Tel: (03) 9653 2100 or (02) 6240 3200

An appropriate citation for this paper is:

Productivity Commission 2009, *Public and Private Hospitals*, Research Report, Canberra.

The Productivity Commission

The Productivity Commission is the Australian Government's independent research and advisory body on a range of economic, social and environmental issues affecting the welfare of Australians. Its role, expressed most simply, is to help governments make better policies, in the long term interest of the Australian community.

The Commission's independence is underpinned by an Act of Parliament. Its processes and outputs are open to public scrutiny and are driven by concern for the wellbeing of the community as a whole.

Further information on the Productivity Commission can be obtained from the Commission's website (www.pc.gov.au) or by contacting Media and Publications on (03) 9653 2244 or email: maps@pc.gov.au

Foreword

Australia spends about 9 per cent of its gross domestic product on health care, and hospital services account for around one-third of this. This report examines three aspects of the health care system — the relative performance of public and private hospitals; rates of informed financial consent for privately-insured patients; and the indexation factor used for the Medicare Levy Surcharge income thresholds.

The first task — comparing the relative performance of hospitals — has been the most challenging part of the study. Diversity within and between the public and private hospital sectors makes like-for-like comparisons difficult, and existing data collections are limited by inconsistent collection methods and missing information.

Foreshadowed developments under the National Healthcare Agreement are expected to improve the quality of hospital-related data, but the Commission has identified further potential improvements, such as consistent national reporting of costs and infections for both public and private hospitals. This report also discusses measures to improve data accessibility, which could ultimately facilitate improvements in health care, especially as competitive markets only have a limited role in the health sector.

A wide range of parties assisted the Commission in conducting the study, including through participation in roundtables, providing technical advice, and making written submissions. The Commission thanks all of those who contributed to the report.

The study was overseen by Commissioner David Kalisch. The staff research team was headed by Greg Murtough and based in the Commission's Melbourne office.

Gary Banks AO
Chairman

December 2009

Terms of reference

Productivity Commission research study into public and private hospitals

The Productivity Commission is requested to undertake a study into public and private hospitals, and report back within 6 months of receipt of this reference.

Context

The Government is committed to improving transparency, accountability and performance reporting within the health system. This commitment is evident in the new National Healthcare Agreement and in COAG's agreement to introduce a nationally consistent approach to activity-based funding in public hospitals. It is also shown by the Government's commitment to move towards nationally consistent performance reporting for public and private hospitals.

In furthering the Government's commitment in this area, the Productivity Commission is requested to examine and report on the relative performance of the public and private hospital systems, and related data issues. As part of its study, the Commission should consider:

a) comparative hospital and medical costs for clinically similar procedures performed by public and private hospitals, using baseline data to be provided by states and territories under the new National Healthcare Agreement, and existing data provided to the Government by private hospitals. The analysis is to take into account the costs of capital, FBT exemptions and other relevant factors.

b) the rate of hospital-acquired infections, by type, reported by public and private hospitals, using baseline data to be provided by states and territories under the new National Healthcare Agreement, and existing data provided to the Government by private hospitals.

c) rates of fully informed financial consent for privately insured patients treated as private patients in both public and private hospitals, categorised by type of provider (that is, public hospital, private hospital, medical practitioner [by Speciality]), and by Statistical Local Area (SLA) or equivalent, including:

c (i) the average cost of out of pocket expenses for patients who do not receive enough financial information from the provider to give fully informed financial consent, the range of these costs and the maximum out of pocket cost incurred by in-hospital patients categorised by type of provider (as detailed above).

c (ii) best practice examples where fully informed financial consent is provided for every procedure, (with a specific emphasis on any best practice examples occurring in specialties where lack of fully informed financial consent is most common).

d) other relevant performance indicators, including the ability of such indicators to inform comparisons of hospital performance and efficiency.

e) If any of the foregoing tasks prove not fully possible because of conceptual problems and data limitations, the Commission should propose any developments that would improve the feasibility of future comparisons.

The Commission will also provide advice to the Government on the most appropriate indexation factor for the Medicare Levy Surcharge thresholds.

The Commission is to consult with relevant experts and others as necessary and produce a final report within six months of receipt of this reference. The report will be published.

CHRIS BOWEN
[Received 15 May 2009]

ASSISTANT TREASURER
SENATOR THE HON NICK SHERRY

Mr Gary Banks AO
Chairman
Productivity Commission
PO Box 1428
CANBERRA CITY ACT 2601

Dear ~~Mr Banks~~ Gary

EXTENSION OF PUBLIC AND PRIVATE HOSPITALS STUDY

Thank you for your letter of 3 August 2009 seeking an extension for the Productivity Commission review of Public and Private Hospitals.

I understand that the Commission has faced delays in obtaining data needed to undertake the study, and that a number of key participants in the review have sought extensions for their submissions. As such, I agree to your request to extend the reporting date from 15 November to 4 December 2009.

I look forward to seeing the draft and final reports in due course.

Yours sincerely

NICK SHERRY

PO Box 6022
Parliament House
CANBERRA ACT 2600

Telephone: 02 6277 7360
Facsimile: 02 6273 4125
http://assistant.treasurer.gov.au

Contents

Boxes

Figures

Tables

Abbreviations and explanations

Abbreviations

ABF	Activity-based funding
ABS	Australian Bureau of Statistics
ACEM	Australasian College for Emergency Medicine
ACERH	Australian Centre for Economic Research on Health
ACHI	Australian Classification of Health Interventions
ACHS	Australian Council on Healthcare Standards
ACSQHC	Australian Commission on Safety and Quality in Health Care
AHCA	Australian Health Care Agreement
AHHA	Australian Healthcare and Hospitals Association
AHIA	Australian Health Insurance Association
AHMC	Australian Health Ministers' Conference
AHSA	Australian Health Service Alliance
AIHW	Australian Institute of Health and Welfare
AIMS	Australian Incident Monitoring System
ALOS	Average length of stay
AMA	Australian Medical Association
ANF	Australian Nursing Federation
APHA	Australian Private Hospitals Association
AR-DRG	Australian Refined Diagnosis-Related Group
ASA	Australian Society of Anaesthetists
ASGC	Australian Standard Geographical Classification
ASX	Australian Securities Exchange
ATO	Australian Taxation Office
AWE	Average Weekly Earnings

AWOTE	Average Weekly Ordinary Time Earnings
AWTE	Average Weekly Total Earnings
BSI	Blood stream infection
CEPA	Centre for Efficiency and Productivity Analysis
CHA	Catholic Health Australia
CHE	Centre for Health Economics (Monash University)
CHF	Consumers' Health Forum
CHI	Centre for Healthcare Improvement
CHRISP	Centre for Healthcare Related Infection Surveillance and Prevention
CIP	Clinical Indicator Program
COAG	Council of Australian Governments
CPI	Consumer Price Index
CRC	COAG Reform Council
DEA	Data Envelopment Analysis
DOHA	Department of Health and Ageing (Australian Government)
DRG	Diagnosis-related group
DVA	Department of Veterans' Affairs
FBT	Fringe-benefits tax
FTE	Full-time equivalent
HCAIU	Health Care Associated Infection Unit (WA Government)
HCI	Hospital cost index
HCP	Hospital Casemix Protocol
HDU	High-dependency unit
HISWA	Healthcare Infection Surveillance Western Australia
HQCC	Health Quality and Complaints Commission (Queensland Government)
ICD-10-AM	International Classification of Diseases, Version 10, Australian Modification
ICS	Infection Control Service (SA Government)
ICU	Intensive-care unit

IFC	Informed financial consent
IGA	Intergovernmental Agreement on Federal Financial Relations
IPHA	Independent Private Hospitals of Australia
MBS	Medicare Benefits Schedule
MDC	Major Diagnostic Category
MIAESR	Melbourne Institute of Applied Economic and Social Research
MLS	Medicare Levy Surcharge
MRO	Multiresistant organism
MRSA	Methicillin-resistant *Staphylococcus aureus*
MSSA	Methicillin-sensitive *Staphylococcus aureus*
NATSEM	National Centre for Social and Economic Modelling
NHA	National Healthcare Agreement
NHCDC	National Hospital Cost Data Collection
NHHRC	National Health and Hospitals Reform Commission
NHMD	National Hospital Morbidity Database
NHPC	National Health Performance Committee
NHPF	National Health Performance Framework
NHS	National Health Survey
NHSN	National Healthcare Safety Network
NNIS	National Nosocomial Infections Surveillance
NP	National Partnership
NPHED	National Public Hospital Establishments Database
OLS	Ordinary least squares
PC	Productivity Commission
PHEC	Private hospital establishments collection
PHI	Private health insurance
PHIAC	Private Health Insurance Administration Council
PHIO	Private Health Insurance Ombudsman
RACS	Royal Australasian College of Surgeons
RAMR	Risk-adjusted mortality ratio

RCN	Royal College of Nursing
ROGS	Report on Government Services
RSI	Relative stay index
SAB	*Staphylococcus aureus* bacteraemia
SCRGSP	Steering Committee for the Review of Government Service Provision
SDF	Stochastic distance function
SEIFA	Socio-Economic Indexes for Areas (Relative Socio-economic Advantage and Disadvantage)
SFA	Stochastic frontier analysis
SLA	Statistical local area
SIR	Standardised Infection Ratio
SPP	Specific Purpose Payment
SSI	Surgical-site infection
TFP	Total factor productivity
TIPCU	Tasmanian Infection Prevention and Control Unit
UCC	User cost of capital
VAED	Victorian Admitted Episodes Dataset
VICNISS	Victorian Nosocomial Infection Surveillance System
VRE	Vancomycin-resistant *enterococci*
WPI	Wage Price Index

Explanations

Billion	The convention used for a billion is a thousand million (10^9).
Findings	*Findings in the body of the report are paragraphs highlighted using italics, as this is.*

Glossary

Activity-based funding	A method of funding hospitals in which hospitals are paid for each episode of care they provide. The amount (price) paid for each episode of care is calculated in advance so that the risk of managing costs is borne by the hospital.
Acute care	Clinical services provided to admitted or non-admitted patients, including managing labour, curing illness or treating injury, performing surgery, relieving symptoms and/or reducing the severity of illness or injury, and performing diagnostic and therapeutic procedures. Most episodes involve a relatively short hospital stay.
Acute hospital	Establishments which provide at least minimal medical, surgical or obstetric services for admitted patient treatment and/or care, and which provide round-the-clock comprehensive qualified nursing service as well as other necessary professional services. They must be licensed by a state/territory health department, or controlled by government departments. It also includes hospitals specialising in dental, ophthalmic aids and other specialised medical or surgical care.
Admitted patient	A patient who has undergone a formal admission process in a hospital to begin an episode of care. Admitted patients may receive acute, sub-acute or non-acute care services.
Admitted patient cost proportion	The proportion of total (or operating) costs that are attributed to admitted patients. Also known as the inpatient fraction.
Adverse event	The unintentional harm arising from an episode of healthcare and not due to the disease process itself.
Allocative efficiency	How well resources are allocated across different uses so as to generate the greatest community wellbeing at a given point in time.

Apgar score	A numerical score used to indicate the baby's condition at one minute and five minutes after birth. Between 0 and 2 points are given for each of five characteristics: heart rate, breathing, colour, muscle tone and reflex irritability, and the total score is between 0 and 10.
Average length of stay	The average number of patient days per admitted patient episode. Patients admitted and separated on the same day are allocated a length of stay of one day.
Australian Refined Diagnosis-related Groups	An Australian system of Diagnosis-related Groups (DRGs). Version 5.0/5.1 is based on the fifth edition of ICD-10-AM. See Diagnosis-related groups.
AR-DRG partitions	Individual AR-DRGs are assigned to a 'surgical', 'medical' or 'other' partition on the basis of the type of procedure involved. A separation is classified as 'surgical' if it includes an operating room procedure. A separation is classified as 'other' if it includes a procedure performed outside of an operating room. A separation is classified as 'medical' if it does not include any type of procedure.
Capital city statistical divisions	A geographic classification of state and territory capital cities defined used by the Australian Bureau of Statistics for general statistical purposes. Each division contains its anticipated urban development (and its associated urban centres) for a period of at least twenty years.
Casemix	The range and types of episodes of care (the mix of cases) treated by a hospital.
Casemix-adjusted	The adjustment of data to account for differences in the number and type (complexity) of cases. Casemix adjustment is an important step to achieving comparable measures of efficiency across hospitals and jurisdictions.
Clostridium difficile	A species of gram-positive bacteria of the genus *Clostridium*, that normally reside in the body. Overpopulation of *Clostridium difficile* is harmful because the release of toxins can lead to bloating, constipation and diarrhoea.

Cost weight	The average costliness of an AR-DRG relative to all other AR-DRGs, such that the average cost weight for all separations is 1.
Data Envelopment Analysis	A linear programming technique used to identify the best-practice frontiers of entities, such as hospitals and firms.
Depreciation	Reduction in the value of an asset due to usage or obsolescence.
Diagnosis-related group	A system used to classify hospital admissions into groups with similar clinical conditions (related diagnoses) and similar resource usage (hospital services).
Dynamic efficiency	How well resources are allocated to achieve the greatest possible community wellbeing over time.
Effectiveness	How successful a hospital is in achieving a particular objective, such as avoiding hospital-acquired infections.
Efficiency	Economic efficiency, in its broadest sense, refers to how well resources are used to benefit the wellbeing of the community as a whole. It comprises productive efficiency, allocative efficiency, and dynamic efficiency.
Elective surgery	Any surgery that a patient's doctor or health professional considers to be necessary but which can be delayed by at least 24 hours. In Australia, elective surgical procedures are defined in the Medicare Benefits Schedule.
Episode of care	The period of admitted patient care between a formal or statistical admission and a formal or statistical separation, characterised by only one care type.
High-dependency unit	An area or environment in a hospital that provides a higher level of critical care and monitoring than is provided in a general ward, but a lower level of care provided by an intensive-care unit.

Hospital	A healthcare facility established under Commonwealth, state or territory legislation as a hospital or a freestanding day procedure unit and authorised to provide treatment and/or care to patients.
Hospital-acquired infection	An infection that appears during the course of care at a hospital or healthcare facility and is the result of that care. Also referred to as nosocomial infection.
Hospital Casemix Protocol	A data collection of the episodes of admitted patient care, benefits and charges for privately insured patients. It includes clinical, demographic and financial information for privately insured admitted patient services.
Hospital cost index	An index of hospital costs published by the Australian Bureau of Statistics.
Informed financial consent	The provision of cost information to patients, including notification of likely out-of-pocket expenses (gaps), desirably prior to agreeing to treatment.
Inpatient fraction	See admitted patient cost proportion.
Intensive-care unit	An area or environment in a hospital that provides the highest level of critical care and monitoring.
International Classification of Diseases	The World Health Organisation's internationally-accepted classification of diseases and related health conditions. The current version ICD-10 forms the basis of Australia's ICD-10-AM.
Labour productivity	A measure of episodes of care per full-time equivalent employee in a hospital or ward.
Length of stay	The period from admission to separation, less any days spent away from the hospital.
Maintenance care	Care in which the treatment goal is prevention of deterioration in the functional and current health status of a patient with a disability or severe level of functional impairment. Following assessment or treatment the patient does not require further complex assessment or stabilisation, and requires care over an indefinite period.

Major Diagnostic Categories	A high-level grouping of patients used in the AR-DRG classification. They correspond generally to the major organ systems of the body.
Medicare Levy Surcharge	A levy on Australian taxpayers who earn above a specified income threshold and do not have private health insurance.
Methicillin-resistant *Staphylococcus aureus*	A strain of the *Staphylococcus aureus* bacterium that is resistant to a number of antibiotics including penicillins (such as methicillin). Patients with open wounds and weakened immune systems are at risk to Methicillin-resistant *Staphylococcus aureus* from hospital staff that do not follow proper sanitary procedures.
Methicillin-sensitive *Staphylococcus aureus*	A strain of the *Staphylococcus aureus* bacterium that is sensitive (not resistant) to a number of antibiotics.
Multiresistant gram-negative bacteria	A class of gram-negative bacteria that are resistant to a multiple range of antibiotics (such as ciprofloxacin, trimethoprim-sulfamethoxazole and amipicillin/sulbactam), and which can lead to bloodstream infections.
Multiresistant organism	Bacteria that are resistant to multiple antibiotics. Such organisms include Methicillin-resistant *Staphylococcus aureus* and vancomycin-resistant *enterococci*.
Multivariate analysis	A statistical analysis technique in which two or more variables are analysed simultaneously.
Non-admitted occasion of service	Occasion of examination, consultation, treatment or other service provided to a non-admitted patient in a functional unit of a health service establishment. Services may include emergency department visits, outpatient services (such as pathology, radiology and imaging, and allied health services, including speech therapy and family planning) and other services to non-admitted patients.
Non-admitted patient	A patient who has not undergone a formal admission process, but who may receive care through an emergency department, outpatient or other non-admitted service.

Partial performance indicator	An indicator of a particular aspect of a hospital's performance that does not take account of other aspects of performance.
Patient days	The aggregate number of days of stay (calculated as separation date minus admission date) for all overnight-stay patients who were separated from hospital during the year. Periods of approved leave are subtracted from these calculations. Same-day patients are each counted as having a stay of one day.
Peer group	A group of hospitals that are broadly similar in terms of their volume of admitted-patient activity and geographical location.
Principal diagnosis	The diagnosis chiefly responsible for occasioning an episode of admitted-patient care.
Private hospital	A privately owned and operated institution, catering for patients who are treated by a doctor of their own choice. Patients are charged fees for accommodation and other services provided by the hospital and relevant medical and paramedical practitioners.
Private patients	Patients admitted to a hospital who decide to choose the doctor(s) who will treat them and/or to have private ward accommodation. They are charged for medical services, food and accommodation.
Procedure	A clinical intervention that is surgical in nature, carries a procedural risk, carries an anaesthetic risk, requires specialised training, and/or requires special facilities or equipment available only in an acute-care setting.
Productive efficiency	The degree to which outputs are produced at least possible cost. It incorporates technical efficiency.
Public hospital	A health care provider facility that has been established under state or territory legislation as a hospital or as a freestanding day procedure unit. Public hospitals are operated by, or on behalf of, the government of the state or territory in which they are established. Public hospitals provide hospital services free of charge to all eligible patients.

Public patient	A patient admitted to a hospital who has agreed to be treated by doctors of the hospital's choice and to accept shared accommodation. This means the patient is not charged.
Recurrent expenditure	Expenditure on goods and services which are used up during the year. Includes salaries and wages, payments to visiting medical officers, expenditure on drug, medical and surgical supplies, and repairs and maintenance. Does not include investment expenditure.
Relative stay index	The actual number of patient days for acute-care separations in selected AR-DRGs divided by the expected number of patient days adjusted for casemix.
Same-day establishments	Day centres, hospitals and freestanding day surgery centres that provide a course of acute treatment on a full-day or part-day non-residential attendance basis at specified intervals over a period of time. Freestanding day surgery centres are approved by the Commonwealth for the purposes of basic table health insurance benefits.
Sentinel events	A limited number of serious adverse events, in which death or serious harm to a patient has occurred.
Separation	An episode of care for an admitted patient, which can be a total hospital stay (from admission to discharge, transfer or death), or a portion of a hospital stay beginning or ending in a change of type of care (for example, from acute to rehabilitation). Separation also means the process by which an admitted patient completes an episode of care either by being discharged, dying, transferring to another hospital or changing type of care.
Statistical local area	The smallest geographic area used by the Australian Bureau of Statistics (in non-Census years) in its Australian Standard Geographic Classification system.
Stochastic frontier analysis	A statistical regression technique used to determine the frontier of best-practice entities such as firms and hospitals.

Sub-acute and non-acute care	Clinical services provided to patients suffering from chronic illnesses or recovering from such illnesses. Services include rehabilitation, planned geriatric care, palliative care, geriatric care evaluation and management, and services for nursing home type patients. Clinical services delivered by designated psychogeriatric units, designated rehabilitation units and mothercraft services are considered non-acute.
Surgical-site infection rate	The number of surgical-site infections for a selected procedure performed during the surveillance period divided by the total number of the selected procedures performed during the surveillance period.
Technical efficiency	The extent to which the quantity of inputs can be reduced without also reducing the quantity of outputs.
Total factor productivity	A measure of output relative to all inputs.
Univariate analysis	The separate exploration of each variable in a data set. It looks at the range of values, as well as the central tendency of the values. It describes the pattern of response to the variable.
Unplanned hospital readmission	An unexpected hospital admission for treatment of: the same condition for which the patient was previously hospitalised; a condition related to one for which the patient was previously hospitalised; or a complication of the condition for which the patient was previously hospitalised.
Unplanned hospital readmission rate	The number of unplanned readmissions to the same hospital that occur within a given period after separation, divided by the total number of separations (excluding deaths), including day stay patients.
User cost of capital	The opportunity cost of the capital used to deliver hospital services. That is, the return that could be generated if the funds were employed in their next best use.
Vancomycin-resistant *enterococci*	A group of bacterial species of the genus *Enterococcus,* found in the digestive and urinary tract, that is resistant to the antibiotic vancomycin.

OVERVIEW

Key points

- Although there is significant diversity within and between the public and private hospital sectors, there are sufficient similarities to warrant comparing them, ideally in a way that takes account of differences in the services provided and patients treated.
- Existing datasets on hospital costs are limited by inconsistent collection methods and missing information. The Commission has sought to address these limitations by drawing on various data sources and incorporating adjustments to make the data more comparable. Nevertheless, the resulting estimates should be considered experimental.
- The Commission's experimental cost estimates suggest that, at a national level, public and private hospitals have similar average costs. However, significant differences were found in the composition of costs. General hospital costs were higher in public hospitals. Medical and diagnostics costs and prostheses costs were higher in private hospitals. Capital costs were higher in public hospitals, but this result is particularly reliant on a range of data sources and adjustments to make the data comparable.
- Australia does not have a robust nationally-consistent data collection on hospital-acquired infections. The limited available evidence suggests that private hospitals have lower infection rates than public hospitals, but this result could be misleading because private hospitals on average treat patients who have a lower risk of infection.
- Other partial indicators show that:
  - private hospitals have higher labour productivity and shorter lengths of stay than public hospitals, but this is at least partly due to casemix and patient differences between the public and private sectors
  - elective surgery in public hospitals is more accessible for disadvantaged socioeconomic groups, but tends to be less timely than in the private sector.
- A multivariate analysis of hospital-level data suggests that the efficiency of public and private hospitals is, on average, similar. The output of individual hospitals in both sectors is, on average, estimated to be around 20 per cent below best practice.
- Improvements could be made to data collections to improve the feasibility of future comparisons. Foreshadowed changes under the National Healthcare Agreement will help in this regard, but more improvements could be made, such as consistent national reporting of costs and infections for both public and private hospitals.
- Only a small proportion of patients incur out-of-pocket expenses without receiving sufficient prior information to give informed financial consent. The medical profession has facilitated best practice by educating practitioners and using internet-based packages to inform consumers.
- The most appropriate indexation factor for the Medicare Levy Surcharge income thresholds is average weekly ordinary time earnings.

Overview

This study examines three aspects of Australia's health care system:

- the relative performance of public and private hospitals, with particular regard to the cost of performing clinically-similar procedures and the rate of hospital-acquired infections
- rates of informed financial consent and out-of-pocket expenses for privately-insured patients in public and private hospitals
- the most appropriate factor for indexing the Medicare Levy Surcharge income thresholds.

The first task — comparing the relative performance of hospitals — has been the most challenging part of the study, particularly in the short time available. This is because hospital complexity and diversity make like-for-like comparisons difficult, and existing data collections are not well suited to the task.

Hospitals are complex organisations, with many essential services delivered by a range of health professionals in a location supported by available technologies, with management oversight and administrative support. This makes comparisons particularly challenging, especially to distinguish genuine differences in performance from variation caused by differences in what hospitals do and who they treat.

Study participants emphasised the importance of taking account of:

- variations in the types of services that hospitals provide, recognising that some hospitals provide more complex health services that are relatively costly to provide and are inherently more risky for patients
- the resource and service implications of providing emergency services (including the need to keep staff and facilities on standby) and clinical training (which can affect the rate of patient throughput), with its potential impact on efficiency and service quality
- the impact of patient characteristics on the performance of public and private hospitals, recognising that patients with more complex conditions and those from lower socioeconomic groups are likely to require more intensive and

expensive health treatment and be more susceptible to hospital-acquired infections
- the additional tax burden that for-profit hospitals face compared to public and not-for-profit hospitals.

Existing datasets have made the task of robust comparison more difficult, with data often defined and collected in different ways between the public and private sectors. To the greatest extent possible, the Commission has sought to adjust for these differences in providing estimates of hospital performance that are as robust and comparable as possible. However, the Commission also readily acknowledges that a number of significant data shortcomings has limited its ability to construct fully comparable estimates.

A common theme throughout this report is that improvements could be made to data collections to improve the feasibility of future comparisons. Foreshadowed changes — such as strengthened national reporting under the new National Healthcare Agreement (NHA) between the Australian, State and Territory Governments — will help in this regard. However, more improvements could be made, such as adopting consistent national reporting of costs and infections across both public and private hospitals.

The Commission encountered significant delays in accessing hospital-related data for this study beyond what could reasonably be expected to address legitimate privacy or confidentiality concerns. Making these data more accessible to a range of users could drive improvements in health care, especially as competitive markets only have a limited role in the health sector. It could also encourage future improvements in data collections.

The community fully meets the cost of data collections in the public hospital sector — including national statistical collections compiled by the Australian Bureau of Statistics (ABS) — and, through public and private contributions to the cost of private hospital care, also contributes to the cost of data collections in the private sector. There is a strong case for maximising the benefits that the community achieves from the data it has paid for. More extensive research and analysis of these data collections could deliver significant improvements in the efficiency and effectiveness of health care.

Australia’s public and private hospital systems

Australian hospitals are part of a comprehensive system of services that together contribute to the nation’s health outcomes. Australia spends about 9 per cent of its gross domestic product on health care, and hospital services account for around one-third of this. There are currently 768 public hospitals and 556 private hospitals, providing 4.7 and 3.1 million episodes of care respectively for admitted patients in 2007-08. The main service provided by hospitals is the treatment of acutely ill people, but many also provide a range of services to the wider community, including radiology and pathology and outpatient care (such as rehabilitation and physiotherapy).

Governments have assumed responsibility for delivering public hospital services in Australia, largely to ensure equity of access. While the provision of services is undertaken by state and territory governments, funding is shared with the Commonwealth Government. Some public hospitals are operated by religious or charitable organisations. Public hospitals are required to provide free treatment to public patients, and are also assigned specific functions under the NHA, including the provision of emergency services, clinical teaching and research, and equity of access. Given that they are funded primarily by governments, the operational incentive for public hospitals is therefore to manage demand within the given budget constraint. Non-price factors, such as elective surgery waiting lists, serve as the 'escape valve' that absorbs excess demand. Additionally, public hospitals face growing community expectations concerning access to hospital services.

Private hospitals do not have the same degree of service obligations as public hospitals, and have more scope to raise revenue from fees. The incentive for private (particularly for-profit) hospitals is to generate returns on their capital investment and labour force, for the benefit of owners/shareholders. However, not-for-profit private hospitals may be more strongly driven by other objectives. Around 60 per cent of private acute and psychiatric hospitals operate on a for-profit basis, while the remainder are run by not-for-profit bodies, such as religious and charitable groups.

Diversity exists not just between the public and private sectors, but also within them. For example, while many large metropolitan public hospitals provide a full range of services and have a large teaching role, many small public hospitals in remote areas offer fewer acute services and may be called upon to deliver other health services, such as primary care and aged care, to regional and remote communities. Many private hospitals specialise in a limited range of surgical procedures, although some offer services akin to the large public hospitals, including an increasing share of the clinical teaching load.

Private hospitals tend to be concentrated in major cities. In comparison, public hospitals are more widely distributed across the country (table 1).

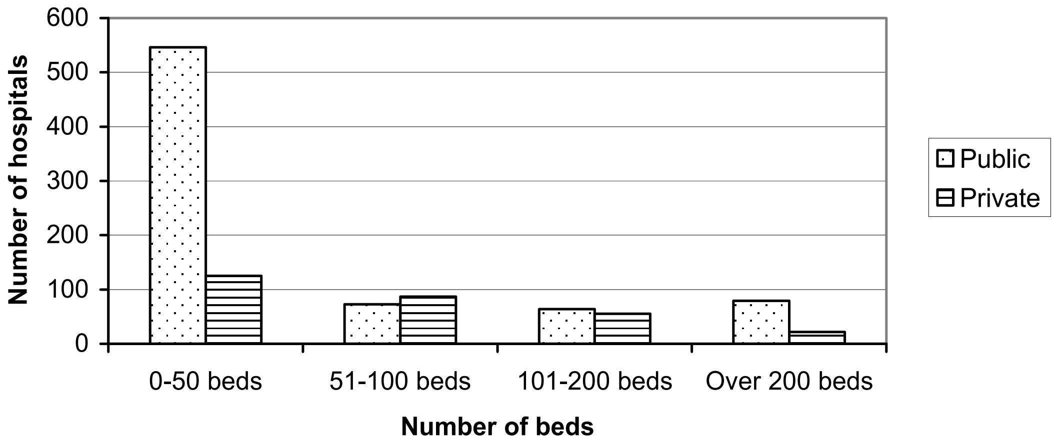
Table 1 **Number of public and private hospitals by region, 2009[a]**

		Private hospitals		
Region[b]	*Public hospitals*	*Day hospitals*	*Other[c]*	*Total*
Major city	164	233	203	436
Inner regional	205	31	64	95
Outer regional	234	7	18	25
Remote	79	–	–	–
Very remote	81	–	–	–
Unable to be classified[d]	5	..	..	..
Australia	768	271	285	556

[a] September 2009. [b] Regional classifications are based on the Australian Standard Geographical Classification. [c] 'Other' comprises private acute and psychiatric hospitals. [d] Unable to be classified due to missing postcodes. – Nil or rounded to zero. .. Not applicable.

Around half of Australia's hospitals have 50 beds or fewer. Although the concentration of small-scale hospitals is higher in the public sector, there is diversity in hospital sizes in both sectors (figure 1). Almost three-quarters of public hospitals have 50 beds or fewer (predominantly in regional and remote areas), while almost 20 per cent have more than 100 beds. In the private sector, over 40 per cent of hospitals have 50 beds or fewer, while over one-quarter have more than 100 beds.

Figure 1 **Number of hospitals by sector and bed numbers[a]**



[a] Acute and psychiatric hospitals. Data for private hospitals are for 2006-07, and for public hospitals are for 2007-08.

Although most patients in public hospitals are treated as public patients, around 14 per cent are treated as private patients, the majority of whom have private health insurance (table 2). Most patients in private hospitals have private insurance or are self-funded. Several state governments have arrangements that allow a small number of public patients to be treated in contracted private hospitals, particularly for elective surgery procedures.

Table 2 **Hospital separations by sector and patient election status, 2007-08[a]**

Per cent of separations in sector

	Patient election status					
Sector	*Public*	*Private insurance*	*Self-funded*	*Dept of Veterans' Affairs*	*Compensation or other* [b]	*Total*
Public hospitals	85.9	8.8	1.2	2.6	1.5	100.0
Private hospitals	2.4	79.8	8.5	6.4	2.9	100.0
All hospitals	52.7	37.0	4.1	4.1	2.1	100.0

[a] Includes same-day facilities. [b] Compensation or other includes workers compensation, other compensation, motor vehicle third party personal claim, other public authorities and other funding sources.

As many study participants commented, public and private hospitals complement each other to some extent by specialising in the provision of different services and treating different patient populations. For example:

- Public hospitals handled around three-quarters of all medical separations (episodes of care), while private hospitals performed around 60 per cent of all surgeries and nearly 70 per cent of other procedures in 2007-08 (table 3).
- Around 95 per cent of outpatient occasions of service (including emergency department presentations) were handled by public hospitals in 2007-08, while nearly two-thirds of elective surgery separations were performed by private hospitals.
- Patients treated in public hospitals are, on average, from lower socioeconomic groups, and have more complex medical conditions.
- A greater proportion of patients in public hospitals are aged under 35 years, while private hospitals treat proportionately more patients aged 35–64 years.

However, there is also overlap between the two sectors, which suggests that, to some extent, public and private hospitals compete to offer substitutable services. For example, the most frequent types of same-day separations in both sectors are renal dialysis, chemotherapy, non-complex colonoscopy and lens procedures (although the respective order of frequency in each sector varies slightly). In addition, a number of private hospitals display features typical of larger public hospitals. In 2006-07, 47 private hospitals treated accident and emergency cases, of which 24 had formal emergency departments, and 47 provided teaching to medical staff and undergraduates.

Table 3 **Types of treatments in public and private hospitals, 2007-08[a]**

	Public hospitals		*Private hospitals*	
	Number of separations	*Per cent of separations*	*Number of separations*	*Per cent of separations*
Surgical	919 109	20	1 232 428	41
Medical	3 397 595	74	1 132 851	38
Other	291 297	6	634 350	21
Total	4 608 001	100	2 999 629	100

[a] Includes same-day facilities. Separations are assigned to the surgical, medical or other categories on the basis of the type of procedure involved. A procedure is a clinical intervention that carries a procedural or anaesthetic risk, and/or requires specialised training, facilities or equipment. A separation is classified as surgical if it involves at least one operating-room procedure; medical if there is no procedure; and other if it involves a procedure performed outside of an operating room, such as dental extractions and colonoscopies.

Many study participants commented that the boundaries between the two sectors are not clear cut, and are complicated by the fact that the two sectors do not operate in isolation from each other, but are inter-related. For example, some public and private hospitals share resources in co-located establishments, a single provider may deliver services in both sectors, and medical staff can work across both sectors.

Costs, productivity and access

The terms of reference ask the Commission to report comparative hospital and medical costs using data to be provided by the states and territories under the NHA and already reported by private hospitals. However, recent policy developments — such as a foreshadowed move to nationally-consistent activity-based funding — have yet to lead to the reporting of all costs on a consistent basis between jurisdictions, or between public and private hospitals. It has therefore been a major challenge to report comparable cost data. It should also be noted that costs are a partial indicator of hospital performance, since they do not include information on other aspects of performance, such as quality and patient safety.

Two commonly-used measures of hospital costs were estimated for this study:

- cost per casemix-adjusted separation — the average cost of treating a range of different diagnoses, after controlling for differences in the complexity of required treatments (casemix adjustment)
- cost per separation — the average cost of treating a group of diagnoses that are clinically similar.

Clinically-similar diagnoses were grouped according to the widely-accepted system of Diagnosis-Related Groups (DRGs), which provides a clinically-meaningful way of relating types of patients treated to required resources. The DRG system only applies to admitted-patient services, and so costs for other services were excluded. Admitted-patient services accounted for 71 per cent of the costs incurred by overnight acute-care hospitals in 2007-08. Furthermore, around 12 per cent of DRGs (about 3 per cent of total annual separations) were excluded from the analysis because there were few separations in at least one sector, and/or activity was confined to less than three hospitals.

Most of the cost data were sourced from the Australian Government Department of Health and Ageing, which has gathered the best available information as part of its regulatory and oversight functions. However, the data collections have significant limitations for this study (box 1). The Commission sought to address these limitations by drawing on various data sources and incorporating adjustments to make the data more comparable, including in response to comments made by study participants on the Discussion Draft. Nevertheless, the cost estimates presented in this report should be treated as experimental.

Overall costs were estimated by summing the various items that contribute to an episode of care. Cost data on these items have varying degrees of accuracy and comparability, and so the Commission distinguished between them using six categories:

- general hospital — ward nursing, ward supplies and other overheads, allied health, critical care, operating rooms, specialist procedure suites, hotel costs, non-clinical salaries, and on-costs
- pharmacy
- emergency departments
- prostheses
- capital — depreciation and the user cost of capital
- medical and diagnostics.

Not all of the above components are under the control of hospitals, and so care should be exercised in interpreting differences in the total cost of an episode of care in public and private hospitals. In particular, it should be noted that medical costs in private hospitals are predominantly a matter between patients and their relevant specialist(s), although private hospitals generally engage a number of salaried doctors.

Box 1 Hospital cost data and their limitations

Most of the cost data used in this study were provided by the Australian Government Department of Health and Ageing from two collections:

- National Hospital Cost Data Collection (NHCDC) — a voluntary annual survey of hospitals, with the latest published results (2007-08) based on responses from hospitals that accounted for 89 per cent of public acute separations and 72 per cent of private acute separations
- Hospital Casemix Protocol (HCP) — a regular census of private health insurance claims in public and private hospitals, collected as part of the regulation of private health insurance. HCP data exclude both public patients, and private patients who do not make a private health insurance claim (who comprised around 90 per cent of separations in public hospitals and 20 per cent in private hospitals in 2007-08).

A key difference between the collections is that the NHCDC has data on hospital expenditure (costs), whereas the HCP has data on amounts charged to patients.

The NHCDC was used as the primary data source because it is designed for cost analysis and covers a significant share of separations in both public and private hospitals. The HCP was only used for private-patient medical and diagnostics costs, as these are not captured in the NHCDC.

While the NHCDC is the best available data source for the purpose of analysing costs, it does have major limitations. For example, the NHCDC data provided to the Commission are from an unweighted sample, and so may not be representative of all hospitals; do not identify how the different tax treatment of for-profit and other hospitals affects costs; and exclude the asset-value data required to calculate a user cost of capital. Other data sources were used to fill some of these gaps, such as ABS surveys of private hospitals and state government asset records.

The Commission also obtained data from the Department of Veterans' Affairs (DVA) on the cost of procuring hospital services for war veterans and their families. While DVA data are not necessarily representative of the whole population, they may provide a broad indication of the robustness of the Commission's estimates. It could be argued that DVA patients are often treated in the same hospitals and by the same clinicians as other private patients. Furthermore, DVA patients may receive broadly comparable treatments in public and private hospitals.

Cost per casemix-adjusted separation (all DRGs)

The Commission's experimental cost estimates suggest that, at a national level, public and private hospitals had a broadly similar cost per casemix-adjusted separation in 2007-08 (table 4).

There do, however, appear to be differences between jurisdictions. In New South Wales and Victoria, private hospitals were estimated to have a higher cost per casemix-adjusted separation than public hospitals. In other jurisdictions, private hospitals were estimated to have a lower cost per casemix-adjusted separation than public hospitals, with the gap particularly large in Western Australia. To some extent, these differences between jurisdictions may also be attributable to inconsistencies in how each jurisdiction measures and reports costs.

Table 4 **Cost per casemix-adjusted separation by jurisdiction and sector, 2007-08**[a]

Dollars

	NSW		*Vic*		*Qld*		*SA*	
Cost component	*Public*	*Private*	*Public*	*Private*	*Public*	*Private*	*Public*	*Private*
General hospital[b]	2 511	1 944	2 106	2 004	2 683	1 948	2 800	1 803
Pharmacy	164	42	235	87	174	45	146	53
Emergency	205	16	251	50	211	40	135	61
Medical & diagnostics[c]	733	1 497	900	1 226	794	1 404	621	1 214
Prostheses	137	620	108	527	121	491	140	495
Capital[d]	439	210	359	240	560	223	381	158
Total[e]	4 189	4 330	3 960	4 133	4 543	4 151	4 223	3 783

	WA		*Tas, NT & ACT*[f]		*Australia*	
	Public	*Private*	*Public*	*Private*	*Public*	*Private*
General hospital[b]	3 094	1 845	3 243	2 236	2 552	1 953
Pharmacy	202	144	186	55	187	68
Emergency	147	11	238	21	208	34
Medical & diagnostics[c]	1 048	1 275	725	1 391	798	1 346
Prostheses	155	555	141	540	131	542
Capital[d]	359	281	447	345	426	230
Total[e]	5 006	4 111	4 980	4 586	4 302	4 172

[a] Costs are casemix adjusted using DRG-level cost weights for public and private hospitals combined. [b] NHCDC cost buckets for ward nursing, non-clinical salaries, allied health, critical care, operating rooms, ward supplies and other overheads, on-costs, hotel costs, and specialist procedure suites. [c] Combination of data from the NHCDC (ward medical, imaging and pathology) and HCP (medical charges, which in the HCP includes diagnostics). [d] Depreciation and the user cost of capital. [e] Totals may not equal sum of components due to rounding. [f] Data for Tasmania, the Northern Territory and the ACT are aggregated to protect the confidentiality of the small number of hospitals in each of these jurisdictions.

There were significant differences between public and private hospitals in the composition of costs. For general hospital costs, public hospitals were estimated to have a higher cost per casemix-adjusted separation than private hospitals ($2552 versus $1953 at the national level). This was also the case with the experimental estimates of capital costs ($426 versus $230). Conversely, average prostheses costs were estimated to be much lower in public hospitals ($131 versus $542). Average medical and diagnostics costs were also estimated to be lower in public hospitals ($798 versus $1346).

A similar pattern in the cost components was evident at the jurisdiction level, and when costs were disaggregated by hospital size and region. The estimates do suggest, however, that private hospitals in outer regional areas had a significantly lower cost per casemix-adjusted separation than public hospitals.

However, the Commission suggests that these estimated differences between public and private hospitals in the composition of costs should be used cautiously. In particular, the Commission found that a significant proportion of public-patient medical costs in the NHCDC are embedded in the general hospital and emergency categories (estimated to be in the order of $270 per separation nationally). Hence, the experimental estimates overstate the cost advantage that public hospitals have in medical and diagnostics, and the cost disadvantage that public hospitals have in general hospital and emergency departments.

Average cost per separation (individual DRGs)

The broad similarity between public and private hospital costs was also evident at the level of individual DRGs (as shown by clustering around the 45 degree line in figure 2). Nevertheless, around one-fifth of DRGs had a cost per separation in public hospitals that was at least 10 per cent lower than in private hospitals, and nearly half of DRGs had an average cost in public hospitals that was more than 10 per cent higher than in private hospitals.

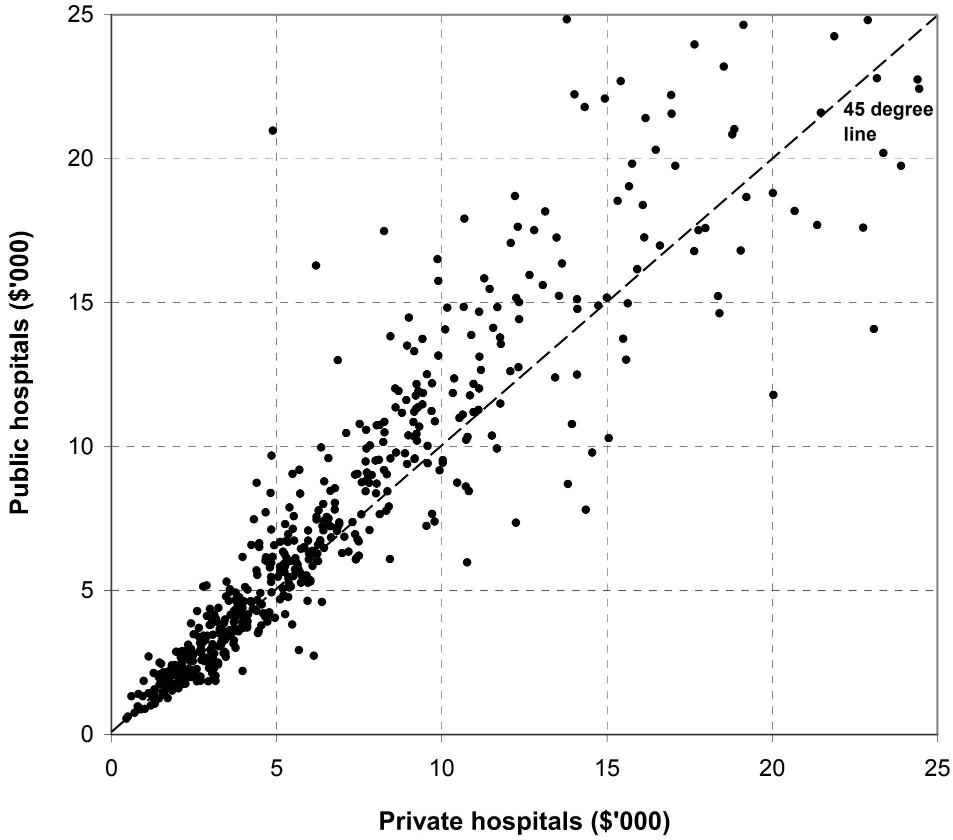
Under the DRG classification system, individual DRGs can be grouped into the 'partitions' of surgical, medical or other. The experimental estimates suggest that almost three-fifths of surgical DRGs had a cost per separation in private hospitals that was at least 10 per cent lower than in public hospitals (figure 3). Medical DRGs were where public hospitals performed most strongly in terms of cost relative to the private sector, with almost a quarter of medical DRGs having a cost per separation in public hospitals that was at least 10 per cent lower than in private hospitals.

The DRG classification system also enables DRGs to be grouped into over 20 different Major Diagnostic Categories (MDCs). The Commission's experimental estimates suggest that, in 2007-08, cost per separation in public hospitals was:

- over 10 per cent *higher* than in private hospitals for almost half the MDC groups
- between 90 and 110 per cent of that in private hospitals for half the MDC groups

- over 10 per cent *lower* than in private hospitals for only one MDC (diseases and disorders of the circulatory system).

Figure 2 **Comparison of cost per separation for individual DRGs in public and private hospitals, 2007-08[a]**



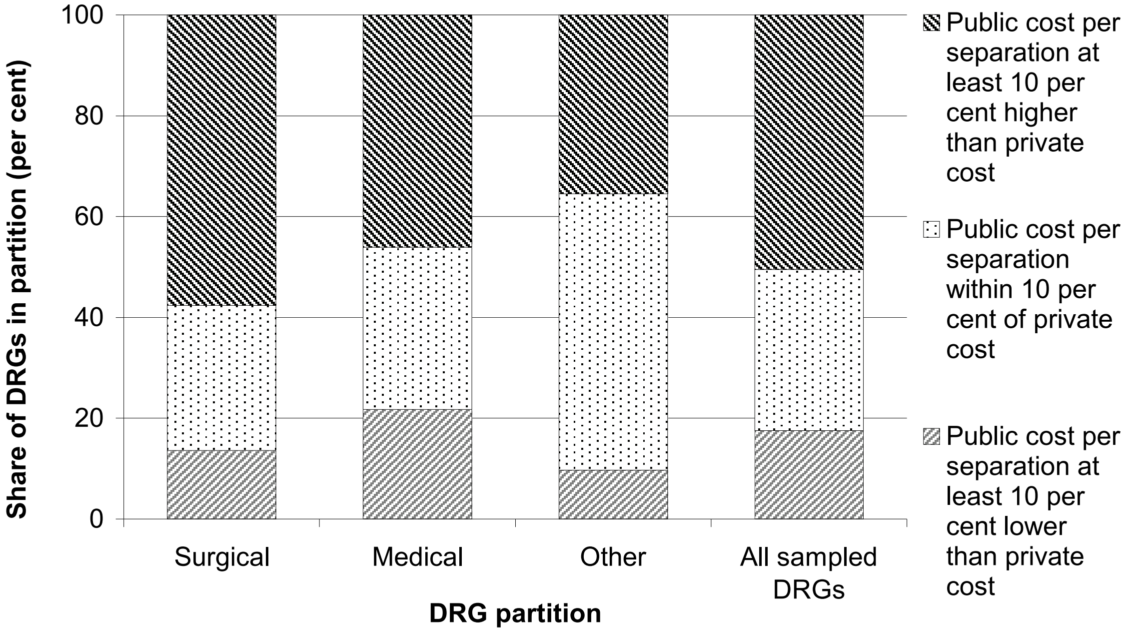
[a] A point is located above (below) the 45 degree line if the relevant DRG has a higher (lower) cost per separation in public hospitals than in private hospitals. DRGs with a cost per separation of more than $25 000 in at least one sector are not shown on the graph. These excluded DRGs accounted for less than 2 per cent of separations among the sampled DRGs and hospitals.

Data from the Department of Veterans' Affairs (DVA) on the cost it incurs in procuring hospital services for veterans and their dependants provide a useful point of comparison with the Commission's DRG-level cost estimates. Data were obtained for the 20 most significant DRGs for DVA on the basis of expenditure. The data indicate that:

- Cost per separation for DVA patients in public hospitals was within 90 to 110 per cent of the Commission's estimates for about one-third of the 20 DRGs, with the remainder evenly split between more than 10 per cent below and 10 per cent above the Commission's estimates.
- Cost per separation for DVA patients in private hospitals are more comparable with the Commission's estimates. Half of the 20 DRGs had a cost for DVA

patients in private hospitals that was within 90 to 110 per cent of the Commission's estimates. The cost for DVA patients in private hospitals was more than 10 per cent below the Commission's estimate for three DRGs, and more than 10 per cent above for the remaining seven DRGs.

Figure 3 **DRG partitions by whether lower cost in public or private hospitals, 2007-08[a]**



[a] Separations are assigned to the surgical, medical or other partitions on the basis of the type of procedure involved. A procedure is a clinical intervention that carries a procedural or anaesthetic risk, and/or requires specialised training, facilities or equipment. A separation is classified as surgical if it involves at least one operating-room procedure; medical if there is no procedure; and other if it involves a procedure performed outside of an operating room, such as dental extractions and colonoscopies.

Partial productivity measures

A major determinant of cost differences between hospitals will be their productivity (quantity of outputs relative to inputs). Ideally, this would be measured in terms of total factor productivity (TFP), which takes account of all inputs and outputs simultaneously. However, the necessary data to measure TFP for hospitals are not available. Instead, the Commission has examined partial productivity measures, which quantify output per unit of a single input, such as labour or medical supplies.

At a national level, public and private hospitals have similar separations per bed (a measure of capital productivity). However, separations per non-medical staff member (a measure of labour productivity) are higher in private hospitals than public hospitals. This suggests that private hospitals have leaner staff-to-bed ratios.

Since 2002-03, both public and private hospitals have increased the intensity with which they use drug, medical and surgical supplies.

Patients in private hospitals have a shorter average length of stay per separation than in public hospitals. This appears to be because surgical procedures in private hospitals have shorter associated patient stays than other DRGs, and private hospitals undertake relatively more surgical procedures than public hospitals.

These findings on hospital productivity should be interpreted with care, since they do not control for the different characteristics of public and private hospitals, such as whether there is an emergency department, patient-risk characteristics, and the geographic remoteness of a hospital. In addition, partial productivity measures do not control for differences in the use of inputs other than those included in the measure.

Access to hospital services

Waiting times

The ability of patients to access timely medical and surgical services is an important objective of governments and motivator for private health insurance. Under the NHA, state and territory governments have agreed to provide hospital services based on clinical need within a clinically-appropriate period.

Emergency department data are collected using nationally-consistent definitions. However, care needs to be exercised when interpreting emergency department waiting data. There are significant differences in the way states and territories assign clinical-urgency categories. In addition, recent findings by the Victorian Auditor-General raise questions about the accuracy of waiting-time data.

The available data suggest that the rates at which patients are seen within emergency department triage benchmarks have improved nationally. The proportion of patients attending emergency departments that were seen on time increased from 66 to 69 per cent between 2002-03 and 2007-08. The proportion of semi-urgent patients that were seen on time increased from 61 to 66 per cent during the same period. However, there were major differences between jurisdictions, with relatively fewer patients seen on time in the ACT and Northern Territory.

The number of people seeking elective surgery grew 4.8 per cent per year between 2002-03 and 2007-08, while the number of elective surgery admissions only grew by 1.8 per cent per year. The average number of days that the 50th percentile patient waited for elective surgery rose from 28 days in 2002-03 to 34 days in 2007-08. On the other hand, the share of patients waiting more than a year fell in New South Wales, Victoria, Queensland, Western Australia and Tasmania, and grew in South Australia, the ACT and the Northern Territory. However, surgery waiting-list times tend to underestimate the actual wait for surgery as they do not account for the time elapsed between referral to and consultation with a surgeon, or between the surgical consultation and being put on a waiting list.

Capacity utilisation

While it is desirable to have utilisation close to capacity in most sectors, and this is generally viewed as an indicator of efficiency, in hospitals there is a tipping point above which a high rate of bed occupancy can impede efficient patient flows, especially if the hospital is subject to the uncertainty of emergency admissions.

The Australian Medical Association and Australasian College for Emergency Medicine noted that a hospital's bed occupancy rate is a useful indication of the likelihood that a patient will have timely access to a hospital bed. Occupancy rates above 85 per cent were claimed to lead to regular bed shortages and periodic bed crises. In 2007-08, public hospitals had an average bed occupancy rate of 87 per cent, although this had declined since 2002-03. Private hospital occupancy rates were, on average, 76 per cent in 2007-08 and had increased since 2002-03.

Improving future comparisons of costs, productivity and access

The Commission's analysis of hospital costs, productivity and access has revealed significant shortcomings in available data for the purpose of comparing public and private hospitals. A foreshadowed shift to nationally-consistent activity-based funding for public hospitals by 2014-15 should lead to more robust cost estimates for the public sector. It would be desirable for private hospitals to report cost data using the same methodology to ensure data consistency with public hospitals, together with some rationalisation of existing private-hospital reporting requirements to minimise the extent of any additional reporting burden. There is also scope for significant improvement in the collection of data on capital costs for both public and private hospitals.

Implementation of the NHA, under which governments have agreed to report nationally-consistent 'progress measures' through the COAG Reform Council, is expected to improve the reporting of partial productivity and access indicators. It would be useful to also have private hospitals report such data using the same methodologies.

Hospital-acquired infections and other safety indicators

Hospital-acquired infections are the most common complication affecting hospital patients, and in many cases are preventable. A recent study estimated that Australia has 180 000 hospital-acquired infections annually and these occupy around two million bed days.

Infections are typically categorised by organism, body location and/or patient population. Organisms that have developed resistance to standard antibiotics — such as methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant *enterococci* (VRE) — are often the focus of reporting regimes because they have the greatest impacts on health systems in developed countries. Another organism that is gaining prominence is *Clostridium difficile*, which usually causes diarrhoea and is the most common cause of health care-associated gastrointestinal infection. The body locations of greatest concern, and hence often reported, are surgical sites and the bloodstream. It also common to report infections for high-risk populations, such as patients in intensive-care units.

The measurement and comparison of infection rates is not straightforward. A hospital could have a relatively high infection rate simply because its workload is concentrated on procedures and patients that have a high risk of infection. It is difficult to disentangle this risk effect from genuine differences in how hospitals perform on infection rates. A common approach is to subdivide infections data into groups with a similar risk of infection, and only compare infection rates within those groups. Such groups could be defined by patient characteristics, procedure and/or type of hospital. For surgical-site infections, many countries stratify data according to a risk index which controls for a patient's physical condition, length of surgery and wound cleanliness. However, none of these risk-adjustment methods fully controls for all of the sources of risk differences between hospitals.

A further problem is that Australia does not have a robust nationally-consistent data collection for comparing hospital-acquired infections. Data from the best available source of national data — the Australian Council on Healthcare Standards (ACHS) — indicate that infection rates rarely differ between public and private hospitals.

ACHS data show that only four out of 47 infection indicators had a statistically significant difference between public and private hospitals in 2007. Where differences existed, the ACHS data suggest that private hospitals consistently have lower infection rates than public hospitals (table 5). However, the ACHS data collection was not designed for inter-hospital comparisons. It is limited by potential sample-selection bias, small sample sizes, self reporting without external validation, and no risk adjustment to reflect patient differences.

Table 5 ACHS infection indicators that differed between public and private hospitals, 2007[a]

Indicator no. and description[c]	Units	Infection rate[b] Public	Infection rate[b] Private	No. of reporting hospitals Public	No. of reporting hospitals Private
1.2 Deep incisional SSI in hip prosthesis procedures[d]	per 100 procedures	0.99	0.63	38	96
1.17 Superficial incisional SSI in abdominal hysterectomy	per 100 procedures	2.02	0.94	16	37
5.2 ICU-associated new MRSA healthcare-associated infections in a nonsterile site	per 10 000 ICU overnight occupied bed days	16.70	7.18	25	23
5.4 Non ICU-associated new MRSA inpatient healthcare-associated infections in a nonsterile site	per 10 000 non-ICU overnight occupied bed days	2.77	1.11	68	59

[a] The ACHS identified an indicator as differing between the public and private sectors if public/private status explained at least 10 per cent of the variation in sampled infection rates, and statistical testing showed that the probability of a difference between public and private rates was at least 95 per cent. However, the data may be misleading due to sample-selection bias, small sample sizes, self reporting, and no risk adjustment to reflect differences in patient characteristics. [b] Mean infection rates after applying the shrinkage estimation method to the data. [c] The following abbreviations are used: ICU (intensive-care unit); MRSA (methicillin-resistant *Staphylococcus aureus*); and SSI (surgical-site infection). [d] The ACHS (sub. 13) advised that unpublished data for 2008 showed that indicator 1.2 was 0.68 per 100 procedures for private hospitals and 1.02 for public hospitals.

More suitable data are collected by state governments as part of their infection-surveillance programs. Such data are not collected and reported on a nationally-consistent basis, but public and private hospitals are included in most cases. The data collected by state governments suggest that private hospitals have lower infection rates than public hospitals, but this result could be misleading because private hospitals generally undertake procedures and treat patients with a lower risk of infection, such as planned (elective) surgery. A more definitive finding will require the development of data collections and methods that enable risk differences between hospitals to be more comprehensively distinguished from genuine differences in performance.

Foreshadowed developments, such as performance reporting under the NHA, will move Australia closer to a robust nationally-consistent data collection on hospital-acquired infections. However, more actions will be required to enable meaningful infection-rate comparisons between public and private hospitals. An important step in this regard would be to include private hospitals in national reporting arrangements. The Australian Commission on Safety and Quality in

Health Care (ACSQHC) is leading and coordinating improvements that should improve the feasibility of future comparisons.

Other safety and quality indicators

Apart from hospital-acquired infections, the Commission examined a number of indicators of quality and patient safety. Many of these were identified for future reporting against the NHA.

ACHS data suggest that there is little difference between public and private hospitals in rates of readmission to hospital within 28 days, and rates of return to operating theatre or intensive-care unit. There are no discernible differences for patient falls, pressure ulcers, adverse transfusion and adverse drug events, intentional self harm, and certain obstetric indicators. ACHS data, however, must be treated with caution, as noted for infection rates.

Data on adverse events, such as those published by the Australian Institute of Health and Welfare (AIHW), suggest that the rate of adverse events in public hospitals is about 5.5 per cent compared to 3.7 per cent for private hospitals. However, these data do not account for differences in the activities undertaken by public and private hospitals, and the extent to which some adverse events, such as adverse reactions to medications, occurred prior to hospitalisation.

The AIHW, at the request of the ACSQHC, has proposed a set of quality and patient safety indicators. A similar set of indicators is being proposed for the NHA. Given the paucity of data in this area, the Commission supports this development.

Multivariate analysis

Partial indicators, such as costs and infection rates, have at least two limitations. First, no single indicator provides an overall assessment of a hospital's performance, since they are by definition partial indicators. Second, there is a large range of factors outside the control of a hospital that can influence its performance, including patient mix and geographic location.

To address the limitations of partial indicators, the Commission also undertook a multivariate analysis of hospital-level data. This involved the use of statistical methods that enable the many different factors influencing a hospital's performance — such as types of patients treated and services provided — to be factored into an overall assessment of performance. Such an approach has been used in many overseas studies of hospitals.

To undertake the multivariate analysis, the Commission used 2006-07 data for:

- 368 acute public hospitals operated by governments, covering all jurisdictions
- 18 acute public hospitals operated by nongovernment bodies, covering all mainland states
- 122 private acute hospitals that collectively account for around 50 per cent of all private hospital separations.

The results of the multivariate analysis suggest that, after controlling for differences in services provided and types of patients treated, the efficiency of public and private hospitals is, on average, similar. It was estimated that the output of individual hospitals in both sectors is, on average, about 20 per cent below best practice among the sampled hospitals.

The multivariate results also suggest that the scope for improvement varies somewhat with hospital size (defined by annual casemix-adjusted separations), particularly for private hospitals. It appears that, among large and very large hospitals (more than 10 000 annual casemix-adjusted separations), the scope to improve efficiency is greatest for public hospitals. At the other extreme, it appears that the scope to improve efficiency among small and very small hospitals (5000 or fewer annual casemix-adjusted separations) is higher for private hospitals, although this result may be partly due to a number of factors that could not be accounted for in the analysis.

There is potential to extend the multivariate approach by also using data that is available for the three preceding years, and to take account of differences in input prices by also modelling a cost function. The Commission intends to undertake this analysis in coming months and publish the results in March 2010.

Informed financial consent

The terms of reference ask the Commission to examine aspects of informed financial consent (IFC) for privately-insured patients. IFC occurs when patients receive relevant cost information, including notification of likely out-of-pocket expenses (gaps), prior to agreeing to treatment. The provision of relevant cost information prior to treatment is desirable as it allows patients to make more informed choices.

It appears that most patients do not face a problem with a lack of IFC. The latest available data show that around 85 per cent of hospital medical services currently provided to privately-insured patients do not have an associated gap payment (excluding excesses and co-payments, which are due to patient choice about insurance cover). For the remaining 15 per cent of services that do have a gap, 4 percentage points involve known-gap agreements where there is a legal requirement to provide IFC. Thus, it could be argued that no more than 11 per cent of services lack IFC. A portion of this 11 per cent would be emergency cases, for which it is not always realistic to expect IFC. Furthermore, there has been a declining number of complaints to the Private Health Insurance Ombudsman about a lack of IFC in recent years. Nevertheless, it is undesirable for any non-emergency patients to incur out-of-pocket expenses without IFC, and desirable for as many emergency patients to receive IFC as is practicable.

The Australian Government Department of Health and Ageing commissioned surveys on IFC in 2004, 2006 and 2007. The surveys were undertaken by Ipsos Australia and asked individuals who had recently made a private health insurance claim for an episode of hospitalisation about the costs they incurred and the information they received about those costs prior to treatment. This is the best available data source to consider IFC and out-of-pocket expenses in the way stipulated by the terms of reference.

However, the Ipsos surveys have a number of potential limitations. There might be sample-selection bias because individuals were more likely to respond to the survey if they did not receive IFC or incurred significant out-of-pocket expenses. This would lead to an understatement of IFC rates and overstatement of gap payments. Another potential limitation is that the surveys relied on patient recollections. The possibility of sample-selection and self-reporting bias was tested by comparing the Ipsos results with (census) data collected by the health insurance regulator (the Private Health Insurance Administration Council, PHIAC). That comparison indicates that the Ipsos surveys overstate the incidence and average size of out-of-pocket expenses (table 6). Analysis of the Ipsos data should therefore be considered in light of the aforementioned data limitations.

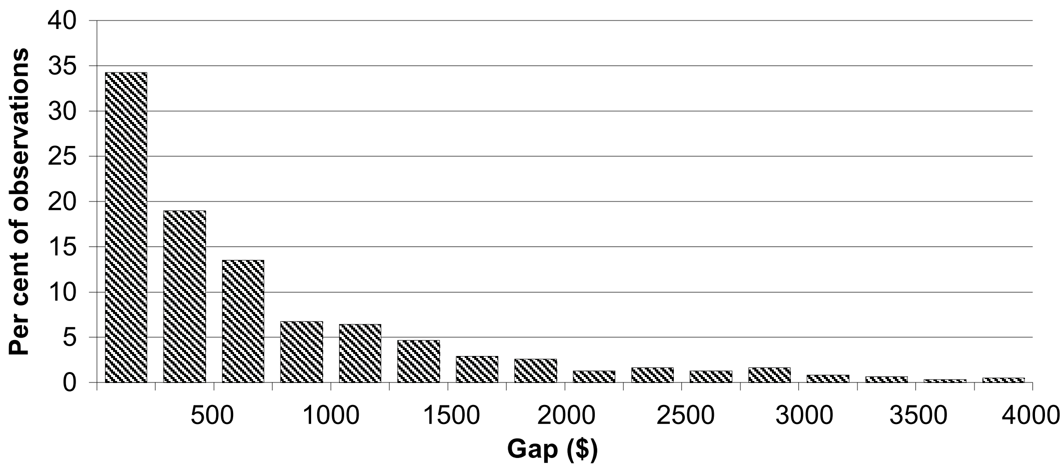
Table 6 **Comparison of Ipsos and PHIAC data, 2007**

	Unit	*Ipsos*	*PHIAC*[a]
Share of services with a gap payment[b]	%	28	18
Share of patients with a gap payment[c]	%	42	na
Average gap across all services[b]	$	131	23
Average gap across all services where a gap occurred[b]	$	465	126

[a] Year to June 2007. [b] Excludes accommodation fees. [c] Excludes test-related specialities. **na** Not available.

The 2007 Ipsos data show that the IFC rate for pre-planned admissions was lowest in private hospitals (around 80 per cent, compared to about 90 per cent in public hospitals) and for treatment by paediatricians (61 per cent). The data also show that, for people who did not provide IFC, the average out-of-pocket gap was greatest in private hospitals ($858, compared to $637 in public hospitals) and for treatment by an orthopaedic surgeon ($753). There was a large range from the minimum to maximum gap ($5 to $19 827), but this was due to a small number of very low and high reported gaps. Of the out-of-pocket gaps where no IFC was provided, around 55 per cent were less than $500, 75 per cent less than $1000, and 90 per cent less than $2000 (figure 4). Only 2 per cent of the gaps were greater than $4000.

Figure 4 **Distribution of non-IFC out-of-pocket gap payments, 2007[a]**



[a] Only patients who considered their admission to be pre-planned are included. Maternity/obstetrics admissions are considered pre-planned. Gaps over $4 000 represented approximately 2 per cent of observations.

The medical profession has sought to promote best practice with respect to IFC in recent years, including through educational campaigns. In addition, some individual specialists are using internet-based packages to inform individual patients about their likely out-of-pocket expenses.

Medicare Levy Surcharge

The Medicare Levy Surcharge (MLS) is imposed on taxpayers who earn above a specified income threshold and do not have private patient hospital cover for themselves and all family members. The MLS is currently calculated at the rate of 1 per cent of taxable income. It was introduced in 1997 as part of a suite of measures designed to arrest a decline in the share of the population with private health insurance (PHI) policies, and to maintain the private hospital system as a complement to the public hospital system. Other measures included a 30 per cent rebate on PHI premiums (introduced in 1999) and the Lifetime Health Cover community rating scheme (introduced in 2000).

There are different MLS income thresholds for singles and couples. The thresholds were originally set in 1997 and remained unadjusted until the 2008-09 financial year, when there was a one-off increase in the thresholds and the introduction of annual indexation for subsequent years. As taxable incomes generally increased between 1997 and 2008, an increasing proportion of taxpayers became subject to the MLS legislation. In 1997-98, around 8 per cent of single taxpayers exceeded the singles income threshold. However with no indexation of the MLS thresholds, this proportion increased to approximately 33 per cent of single taxpayers by 2007-08.

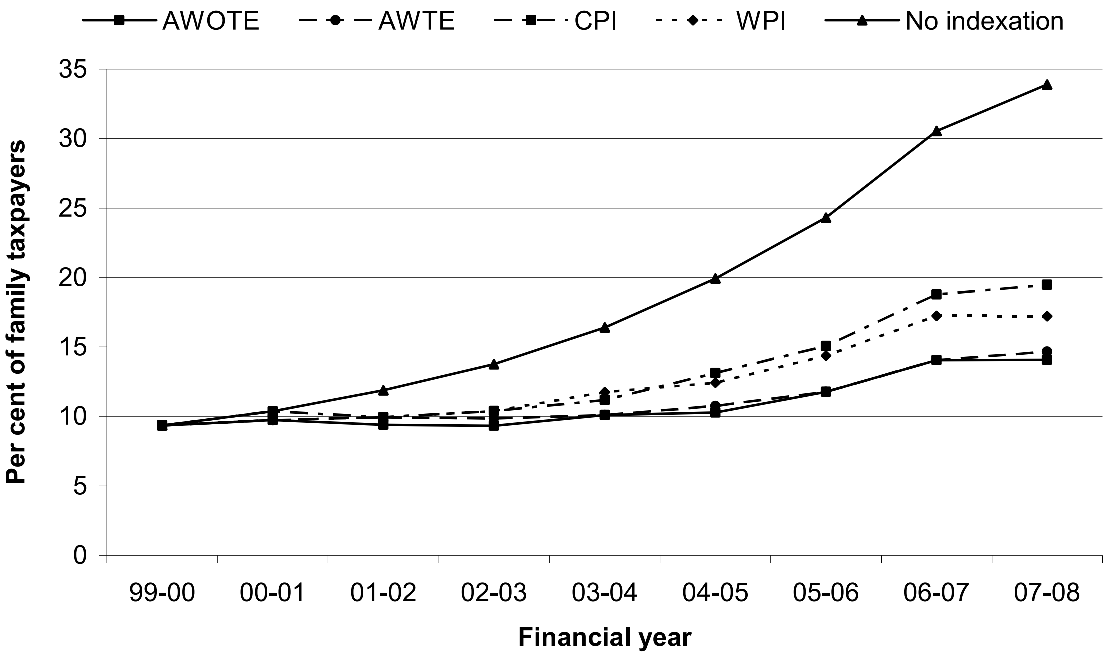
The Commission has been asked to consider the most appropriate indexation factor for the MLS income thresholds. The thresholds are currently indexed by average weekly ordinary time earnings (AWOTE). This was compared to three alternatives:

- average weekly total earnings (AWTE)
- consumer price index (CPI)
- wage price index (WPI).

The Australian Government has stated that the primary reason for indexing the income thresholds is to ensure that the MLS remains targeted at the 'high' income group for which it was intended. The suitability of the alternative indexation factors was therefore assessed by determining how successful they would be in keeping the share of taxpayers subject to the MLS stable over time. The assessment involved estimating how the thresholds would have changed if there had been indexation since 1999-2000.

If the MLS income thresholds had been indexed since 1999-2000, the proportion of taxpayers subject to the MLS would have risen (by varying amounts) using each of the potential indexation factors assessed by the Commission (figure 5). In theory, this could be avoided by using an indexation factor based on the ninth decile (90th percentile) of the income distribution, as it would specifically measure income changes for higher income earners. However, such a measure is not currently available in a form suitable for the regular updating of the MLS income thresholds. The Commission has therefore concluded that AWOTE is the most appropriate indexation factor, since among the available options it would keep the share of taxpayers subject to the MLS most stable.

Figure 5 **Proportion of family taxpayers subject to the MLS under alternative indexation options, 1999–2008[a]**



[a] For simplicity, the $1500 threshold increase for a second and each additional child was not taken into account in the calculations. Therefore, the figure slightly overstates the proportion of family taxpayers who would have been subject to the MLS.

Findings

Data availability

FINDING 1.1

The Commission encountered significant delays in accessing hospital-related data beyond what could reasonably be expected to address privacy or confidentiality concerns. There is a case for making these data more accessible to a range of users because this could drive improvements in health care, especially as competitive markets only have a limited role in the health sector. It could also encourage future improvements in the data collections. Data agencies could facilitate greater data access by:

- *having established protocols allowing access to data that does not breach privacy rules and meets certain public-interest requirements*
- *strengthening the mechanisms through which data users can provide ongoing input on how data are collected and made available for analysis and research.*

FINDING 1.2

Information collected by the Australian Bureau of Statistics (ABS) at considerable public expense is a valuable resource for Australia. The Commission found that the ABS has a number of requirements that can restrict measured use of these public data, which the Commission suggests be reviewed by the Australian Government. There are also barriers to accessing data held by the Australian Institute of Health and Welfare (AIHW), due to a requirement to obtain approval from jurisdictions to release the data. This could be addressed by the states and territories delegating the approval of individual data requests to the AIHW, particularly where information would only be divulged to established data users and in a form that does not identify individual patients or hospitals.

Australia’s public and private hospital systems

FINDING 4.1

Although there is significant diversity within and across the public and private hospital sectors in Australia, there are a number of key similarities between public and private hospitals that enable and encourage comparison between the sectors. It is acknowledged that there are some differences in the activities undertaken by public and private hospitals and that the sectors do not always service a comparable patient population, which makes comparisons more difficult.

Costs

FINDING 5.1

Existing datasets on hospital and medical costs are limited by inconsistent collection methods and missing information. The Commission has sought to address these limitations by drawing on various data sources and incorporating adjustments to make the data more comparable where possible, as well as noting data deficiencies where they exist. The resulting estimates of hospital and medical costs should be considered experimental.

FINDING 5.2

The Commission’s experimental cost estimates suggest that, at a national level in 2007-08, public and private hospitals had broadly similar costs per casemix-adjusted separation. There were, however, significant differences in the composition of estimated costs:

- *the combined cost of nursing and other salaries, allied health, operating rooms and specialist suites, critical care, hotel costs, supplies, and on-costs were on average higher for public hospitals*
- *medical and diagnostics costs were higher for private hospitals, although there are some recognised constraints with available data not separately identifying all medical costs in public hospitals*
- *prostheses costs were higher in the private sector, but this is also likely to reflect a broader range of products being available for use in private hospitals compared to the public hospital sector*
- *capital costs were estimated to be somewhat higher for public hospitals, but the extent of this result is particularly reliant on a range of data sources and adjustments to make the data more comparable.*

These differences were also evident when the estimates were disaggregated by jurisdiction, region and hospital size.

FINDING 5.3

A disaggregation of the Commission's experimental cost estimates by diagnosis-related groups (DRGs) suggests that in 2007-08:

- *nearly one-fifth of DRGs had an average cost in public hospitals that was at least 10 per cent lower than in private hospitals, and about half of DRGs had an average cost in public hospitals that was more than 10 per cent higher than in private hospitals*
- *almost three-fifths of surgical DRGs had a cost per separation in public hospitals that was at least 10 per cent higher than in private hospitals, and medical DRGs were where public hospitals performed most strongly in terms of cost relative to the private sector.*

FINDING 5.4

A foreshadowed shift to nationally-consistent activity-based funding for public hospitals is expected to eventually lead to more robust cost data for the public sector. However, there remains considerable scope to improve the quality and consistency of hospital and medical cost data in Australia. In particular, there is a need for:

- *private hospitals to report cost data using the same methodology as public hospitals, and to continue to have a high level of participation in the National Hospital Cost Data Collection, so that the data are reliable and can be disaggregated by sector, region, and size and type of facility*
- *items directly billed to private patients — such as some medical, diagnostics and medicines — to be linked with cost data reported by hospitals so that all costs associated with an episode of care are captured in a single collection*
- *reliable data on capital costs, hospital administration costs, head-office overheads, and the cost of medicines prescribed to hospital patients*
- *quantification of the additional FBT liability that for-profit hospitals incur by not having the FBT exemption that is available to other hospitals.*

This may require a strengthening of data-related provisions in the National Healthcare Agreement for public hospitals, and data-reporting requirements for private hospitals. If this is the case, governments need to be conscious of the regulatory burden on reporting hospitals and, where possible, seek to limit it by avoiding duplication and inconsistency in reporting arrangements, and by utilising cost-effective electronic reporting of data.

Hospital-acquired infections

FINDING 6.1

Australia does not have a robust nationally-consistent data collection on hospital-acquired infections. The limited available evidence suggests that private hospitals have lower infection rates than public hospitals, but this result could be misleading because private hospitals generally treat patients who have a lower risk of infection. A more definitive finding will require the development of data collections that enable risk differences between hospitals to be distinguished from genuine differences in performance.

FINDING 6.2

Foreshadowed developments, such as performance reporting under the National Healthcare Agreement, will move Australia closer to a robust nationally-consistent data collection on hospital-acquired infections. However, more actions will be required to enable meaningful infection-rate comparisons between public and private hospitals. An important step in this regard would be to include private hospitals in national reporting arrangements. The Australian Commission on Safety and Quality in Health Care is leading and coordinating initiatives that should improve the feasibility of future comparisons.

Other partial indicators

FINDING 7.1

Private hospitals appear to operate relatively leaner staffing levels than public hospitals, although it is not clear how much of this difference can be explained by the higher provision of emergency department and outpatient clinic services by public hospitals.

FINDING 7.2

Private hospitals exhibit shorter lengths of stay than public hospitals. This is due to private hospitals exhibiting relatively shorter lengths of stay for surgical procedures and undertaking relatively more surgical procedures than public hospitals.

FINDING 7.3

Timely access to elective surgery is less likely in public hospitals than in private hospitals. The relatively high bed occupancy rates in public hospitals restrict their ability to manage their unpredictable workload. Equity of access is more likely in public hospitals than private hospitals, since public hospitals provide relatively more elective surgery to patients from poor socioeconomic areas and from more remote areas of Australia.

FINDING 7.4

The work of the Australian Commission on Safety and Quality in Health Care and the Australian Institute of Health and Welfare to develop a national set of safety and quality indicators could provide a basis for future comparisons between public and private hospitals. However, the paucity of published, comparable and reliable hospital-level data severely limits these comparisons, and will continue to limit such comparisons in the future. Making consistent hospital-level data available to all interested parties would assist with future comparisons between hospital sectors and contribute to improvements in care.

Multivariate analysis

FINDING 8.1

A multivariate analysis of Australian hospital-level data established the best-practice benchmarks for each hospital in the sample. The benchmarks were influenced by a number of factors. The best-practice benchmarks were lower for hospitals that treat:

- *highly morbid patients*
- *patients from lower socioeconomic communities*
- *relatively more medical cases, as these cases are more difficult to manage*
- *more complex cases, although this is less so for the largest hospitals.*

FINDING 8.2

After controlling for differences in services provided and types of patients treated, the efficiency of public and private hospitals is, on average, similar. It was estimated that the output of individual hospitals in both sectors is, on average, around 20 per cent below best practice among the sampled hospitals. Among large and very large hospitals, the scope to improve technical efficiency is slightly greater for public hospitals. At the other end of the scale, the scope to improve efficiency is higher for small and very small private hospitals, although these results may be partly due to a number of factors that could not be accounted for in the analysis.

Informed financial consent

FINDING 9.1

According to the Private Health Insurance Administration Council, around 90 per cent of hospital services for privately-insured patients do not have out-of-pocket expenses that require informed financial consent. Complaints data collected by the Private Health Insurance Ombudsman suggest that the rate of informed financial consent has been increasing in recent years.

FINDING 9.2

The incidence and average size of out-of-pocket expenses for privately-insured patients appear to be overstated in available survey data collected by Ipsos, due to sample-selection and self-reporting bias. Subject to this qualification, the data suggest that privately-insured patients have a higher rate of informed financial consent and lower out-of-pocket expenses in public hospitals. Few conclusions can be made about out-of-pocket expenses due to small sample sizes.

FINDING 9.3

A more robust future data source on informed financial consent (IFC) could be created by requiring privately-insured patients to indicate on their health insurance claim form whether they provided IFC prior to the procedure. Alternatively, medical specialists and service providers could be required to include as part of the billing and insurance-claim process an indication of whether documented evidence of IFC is held for the relevant item. This information could be collected and reported by the Private Health Insurance Administration Council.

FINDING 9.4

The medical profession has sought to promote best practice for informed financial consent in recent years. This has included educational campaigns for practitioners and internet-based packages to inform consumers of their likely expenses.

Indexation of Medicare Levy Surcharge thresholds

FINDING 10.1

Average weekly ordinary time earnings is the most appropriate indexation factor for the Medicare Levy Surcharge income thresholds.

1 Introduction

Key points

- This study examines three aspects of Australia's health care system:
  - the relative performance of public and private hospitals, with particular regard to the cost of performing clinically-similar procedures and the rate of hospital-acquired infections
  - rates of informed financial consent and out-of-pocket expenses for privately-insured patients in public and private hospitals
  - the most appropriate factor for indexing the Medicare Levy Surcharge (MLS) income thresholds.
- The report is structured as follows:
  - identification of relevant characteristics of the public and private hospital systems (chapters 2 to 4)
  - comparison of public and private hospital performance using partial indicators, including for costs and infection rates (chapters 5 to 7)
  - discussion of a more comprehensive (multivariate) approach that the Commission has used to assess relative performance (chapter 8)
  - examination of rates of informed financial consent and out-of-pocket expenses for privately-insured patients (chapter 9)
  - assessment of alternative indexation factors for the MLS income thresholds (chapter 10).
- The Commission encountered significant delays in accessing hospital-related data for this study that cannot be justified on privacy or confidentiality grounds.
- There is a case for making hospital data more accessible to a range of users because this could drive improvements in health care, especially as competitive markets have only a limited role in the health sector. It could also further encourage future improvements in data collections.
- The Commission thanks study participants for meeting with the Commission, participating in roundtables and teleconferences, providing data and other assistance, and making written submissions.

This commissioned study examines issues related to Australia's public and private hospital systems, which are an important part of a comprehensive system of services that together contribute to the nation's health outcomes. The Australian Government noted in the terms of reference that it requested this study to further its commitment to improving transparency, accountability and performance reporting within the health system.

1.1 What the Commission has been asked to do

The terms of reference for this study are provided at the front of this report. In summary, the Commission has been asked to undertake three distinct tasks:

- compare the relative performance of the public and private hospital systems, with particular regard to the cost of performing clinically-similar procedures and the rate of hospital-acquired infections
- report rates of informed financial consent and out-of-pocket expenses for privately-insured patients
- advise the Government on the most appropriate factor for indexing the Medicare Levy Surcharge (MLS) income thresholds.

The analysis of costs is to take into account the cost of capital, fringe-benefits tax exemptions and other relevant factors. Hospital-acquired infections are to be reported by type of infection. Informed financial consent and out-of-pocket expenses are to be disaggregated by sector, region and medical specialist.

If the above tasks prove not fully possible because of conceptual problems or data limitations, the Commission has been asked to propose developments to improve the feasibility of future comparisons.

1.2 Report structure and study approach

The Commission has structured the analysis in this report as follows:

- identification of relevant characteristics of the public and private hospital systems (chapters 2 to 4)
- comparison of public and private hospital performance using partial indicators, including for costs and infection rates (chapters 5 to 7)
- discussion of a more comprehensive (multivariate) approach to assess the relative performance of public and private hospitals (chapter 8)
- examination of rates of informed financial consent and out-of-pocket expenses for privately-insured patients (chapter 9)

- assessment of alternative indexation factors for the MLS income thresholds (chapter 10).

Comparing the relative performance of hospitals has been the most challenging part of the study, particularly in the short time available. This is because hospital complexity and diversity make like-for-like comparisons difficult, and existing data collections are not well suited to the task. Further elaboration of the study approach is provided below.

Hospital complexity and diversity

Given the significance of hospital complexity and diversity to the relative performance of public and private hospitals, a significant part of the report is devoted to describing these characteristics (chapters 2 to 4), and this precedes the analysis of relative performance (chapters 5 to 8).

Hospitals are generally complex organisations, with many essential services produced by a range of health professionals in a location supported by available technologies, with management oversight and administrative support. This makes comparisons particularly difficult, especially to distinguish genuine differences in performance from variation caused by differences in what hospitals do and who they treat.

Study participants emphasised the importance of taking account of:

- variations in the types of services that hospitals provide, recognising that some hospitals provide more complex health services that are most costly to provide and are inherently more risky for patients
- the disruption to planned activity than can be caused by the presence of an emergency department, and that clinical training can affect the rate of throughput
- the impact of patient characteristics on the performance of public and private hospitals, recognising that patients with more complex conditions and those from lower socioeconomic groups require, on average, more intensive health treatment and are more susceptible to hospital-acquired infections
- the additional tax burden that for-profit hospitals face compared to public and not-for-profit hospitals.

Relative performance

In undertaking its assessment of relative performance, the Commission has been mindful of the fact that the community places importance on various aspects of hospitals, including safety, timeliness and amount of resources used. It is difficult to capture all of these aspects in a single measure, and so it is common to report a suite of partial indicators that each measure a particular aspect of performance.[1] This approach is reflected in the terms of reference, which specifically asks the Commission to compare partial indicators for costs and hospital-acquired infections. This is done in chapters 5 and 6 respectively.

Existing datasets on hospital costs are limited by inconsistent collection methods and missing information. In chapter 5, the Commission has sought to address these issues by drawing on various data sources and, where necessary, incorporating adjustments to make the data more comparable. However, the Commission readily acknowledges that a number of significant data shortcomings have limited its ability to construct fully comparable estimates. Data on hospital-acquired infections also have limitations for the purpose of comparing public and private hospitals, which are discussed in chapter 6.

As requested in the terms of reference, the Commission has also considered other indicators of relative performance. Partial indicators of hospital productivity, access, and quality and patient safety are examined in chapter 7. Again, data deficiencies were a constraint on this analysis.

Multivariate analysis

Apart from data deficiencies, a further limitation of individual partial indicators is that they focus on a particular aspect of performance, such as costs, without taking account of other aspects, such as patient safety. This makes it difficult to form an overall assessment of performance, even when various partial indicators are considered collectively. Furthermore, partial indicators rarely control for all differences that are outside the control of a hospital, such as geographic location and patient characteristics, which makes it difficult to achieve like-for-like comparisons between hospitals.

As detailed in chapter 8, the Commission has used multivariate statistical techniques to address the limitations of partial indicators in forming an overall

---

1 Examples of this multiple-indicator approach are the National Health Performance Framework developed for the Australian Health Ministers' Conference (AIHW 2008b; NHPC 2001), and the 'performance indicator framework' that the Steering Committee for the Review of Government Service Provision uses for public hospitals (SCRGSP 2009).

assessment of relative performance. Multivariate analysis has been used successfully in many overseas studies of hospital performance, but its application in Australia has been limited to date and with identified deficiencies that the Commission has sought to overcome.

Outcomes and outputs

Ideally, hospital performance would be measured in terms of patient outcomes. Individuals seek hospital services in order to improve their physical and emotional wellbeing relative to what would otherwise be the case. A wide range of measures have been developed to measure outcomes, including changes in mortality rates, life expectancy and quality of life.

To a limited extent, the Commission has been able to use proxies for health outcomes such as infection rates and unplanned readmissions to hospital. However, like many other studies, data limitations have caused the Commission to mainly assess performance in terms of hospital outputs, such as the number of patients treated and procedures performed.

Measuring performance in terms of outputs has the disadvantage that it does not directly quantify the degree to which a hospital achieves its primary purpose — to improve health outcomes. Hospital activity may lead to little improvement in health outcomes for some individuals, or in extreme cases lead to worse outcomes. However, outputs tend to be easier to measure than outcomes, because the latter requires tracking of patient health after hospital discharge. As the Centre for Health Economics (Monash University) noted, such data are not generally available:

> Ideally, hospital-level data … linked up to outcomes data would be available with associated input data on numbers/costs of staff, other inputs (drug use, technology etc) and capital. Unfortunately this isn't the case … (sub. 7, p. 2)

Another reason for measuring performance in terms of outputs is that outputs can be readily attributed to how a hospital manages its resources, whereas attributing cause and effect is far more difficult for outcomes (Hollingsworth and Peacock 2008).

Effectiveness and efficiency

The Commission has used measures of both effectiveness and efficiency to examine the relative performance of hospitals.

Effectiveness refers to how successful a hospital is in achieving a particular objective, such as avoiding hospital-acquired infections.

Efficiency, in its broadest sense, refers to how well resources are used to benefit the wellbeing of the community as a whole (which is determined by service quality, as well as financial costs). This broad interpretation is known as 'economic efficiency' and has three components — the degree to which outputs are produced at least possible cost (productive efficiency), how resources are allocated across different uses so as to generate the greatest community wellbeing at a given point in time (allocative efficiency), and to achieve the greatest possible wellbeing over time (dynamic efficiency) (box 1.1).

Box 1.1 **Components of economic efficiency**

Economic efficiency is about maximising the wellbeing of the community. It requires satisfaction of three components: productive, allocative and dynamic efficiency.

Productive efficiency is achieved when output is produced at minimum cost. It includes technical efficiency, which refers to the extent to which, in the production of any good or service, it is technically feasible to reduce any input without decreasing the output, and without increasing any other input.

Allocative efficiency is about ensuring that the community gets the greatest return (very broadly defined) from its scarce resources. A nation's resources can be used in many different ways. The best or 'most efficient' allocation of resources is the one that contributes most to community wellbeing.

Dynamic efficiency refers to the allocation of resources over time, including allocations designed to improve economic efficiency and to generate more resources. This can mean finding better products and better ways of producing goods and services, which may involve investments in education, research, development and innovation. Dynamic efficiency can also refer to the ability to adapt efficiently to changed economic conditions, a capacity for optimally modifying output and productivity performance in the face of economic 'shocks'.

Source: PC (2006b, 2008b).

In essence, the Commission has been asked to examine the (level and mix of) inputs used by hospitals to produce their current outputs, and so the most relevant concept is productive efficiency. The Commission has not been asked to consider the much broader question of how well resources are allocated across different parts of the health sector, which is measured by allocative efficiency. However, by comparing the performance of public and private hospitals, this study could provide insights into the potential to improve allocative efficiency.

The Commission recognises that the productive efficiency of hospitals in one sector relative to the other could depend on the distribution of activity between the two sectors, and so there might be an interdependence between productive and allocative efficiency. In this regard, the Australian Government Department of Health and Ageing (DOHA) noted that:

> Productive and allocative efficiency are often interdependent, with allocative efficiencies allowing productive efficiencies to produce their maximum benefit. This can account for some of the perceived differences in efficiency between public and private hospitals. (sub. 32, p. 14)

Informed financial consent and MLS indexation

The Commission's analysis of informed financial consent and out-of-pocket expenses for privately-insured patients is based on survey data collected for DOHA in 2004, 2006 and 2007 (chapter 9). In essence, these surveys provide the only available data for this purpose. However, the Commission has had to qualify its results because the survey data appear to be affected by sample-selection and self-reporting biases.

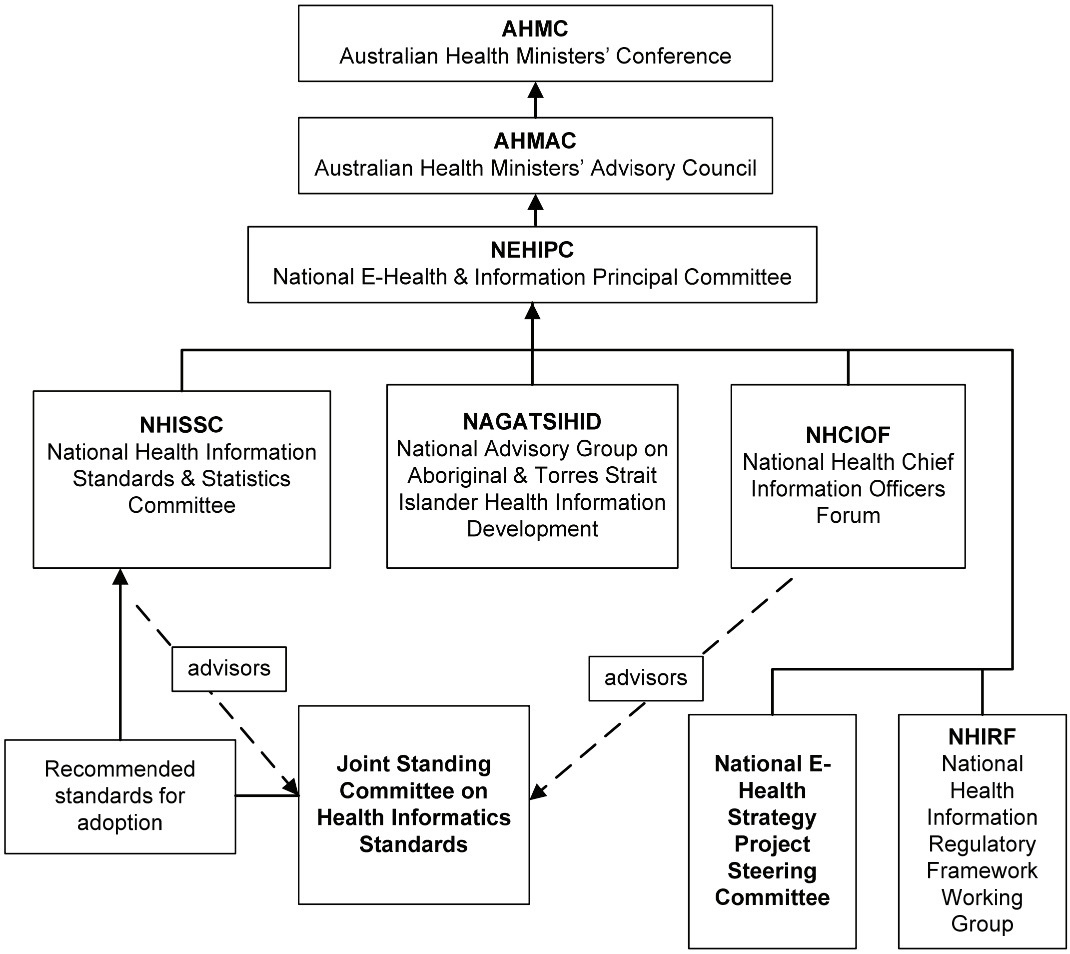
In chapter 10, the suitability of four alternative available indexation factors is assessed by estimating how successful they would have been in keeping the MLS focused on high-income earners in recent years. The primary reason for indexing the MLS income thresholds is to ensure that the MLS remains targeted at the high-income group for which it was intended.

1.3 Future data improvements

Significant progress has been made since the early 1990s in developing national data standards and datasets on health matters, and this has assisted the Commission in undertaking this study. A key development was the 1993 National Health Information Agreement (NHIA) between Commonwealth, state and territory health authorities, the ABS and AIHW. The current version of the NHIA was adopted in 2004 and also included the Department of Veterans' Affairs as a signatory. More recently, the National Healthcare Agreement (NHA) has provided added impetus for the collection and maintenance of nationally-consistent datasets.

Governance arrangements are in place to ensure relevant agencies and jurisdictions coordinate their efforts with regard to nationally-consistent data collections. In particular, the National E-Health and Information Principal Committee (NEHIPC) is responsible for overseeing implementation of the NHIA, and is advised by the National Health Information Standards and Statistics Committee (NHISSC) (figure 1.1). NEHIPC comprises representatives from the NHIA signatories and reports to the Australian Health Ministers' Advisory Council, which in turn reports to the Australian Health Ministers' Conference. The AIHW provides a secretariat for the NHISSC.

Figure 1.1 **Governance arrangements for national health data**



Source: AIHW (2009e).

Nevertheless, a common theme throughout this report is that improvements could be made to data collections to improve the feasibility of future comparisons. Foreshadowed changes — such as strengthened national reporting under the NHA — will help in this regard. However, as requested in the terms of reference, the Commission has identified other improvements that could be made.

Improvements to specific data collections are discussed in following chapters in the context of the relevant indicators being examined. More generally, the feasibility of future comparisons could be improved by making hospital-related data more accessible. The Commission encountered significant delays in accessing hospital-related data beyond what could reasonably be expected to address privacy or confidentiality concerns. In one instance, a jurisdiction insisted on obtaining approval from the head of its health department before providing data that had already been published as a chart in one of its reports.

The difficulty in accessing hospital-related data is reflected in an absence of significant past research on the relative performance of Australian public and private hospitals. This is despite a large amount of data being collected, and the issue of relative performance of public and private hospitals having been debated for many years in Australia (for example, Butler 1988b). The Commission has previously reviewed published research on hospital performance, from which it concluded that the gap between existing and best-practice productivity might be in the order of 20–25 per cent for the Australian (public and private) hospitals sector as a whole (PC 2006a). However, this conclusion was based on a combination of the limited Australian research, particularly for the private sector, and overseas studies which may be of limited relevance to Australia.

A number of study participants outside government shared the Commission's concerns about the difficulty in accessing hospital-related data (for example, Australian Health Service Alliance, sub. DR53; Catholic Health Australia, sub. DR62; Centre for Health Economics Research and Evaluation, sub. DR68; National Coalition of Public Pathology, sub. DR49; Queensland Nurses Union, sub. DR51; Rhonda Kerr and Associates, Health Planning, sub. DR44). In contrast, government agencies responsible for collecting and/or handling data noted that they were constrained by legislative requirements to maintain privacy and confidentiality (for example, NSW Health, sub. DR64; SA Department of Health, sub. DR45). An overview of existing privacy legislation is provided in box 1.2.

There is a legitimate case for privacy and confidentiality safeguards, but it would be unfortunate if these hindered data access beyond what is necessary to maintain privacy and confidentiality. The Centre for Health Economics Research and Evaluation claimed that:

> Researchers are often refused access to health-related administrative data with unjustifiable claims to privacy or confidentiality. While patient privacy is an important issue, appropriate governance procedures for de-identified data can provide the necessary privacy protections. (sub. DR68, p. 1)

Given the public expense involved in collecting and maintaining data on health care, and the potential gains to health outcomes from policies and processes designed on the basis of the best evidence, there appear to be some broader public interest aspects that also need to be considered alongside legitimate privacy and confidentiality concerns.

Box 1.2 **Privacy legislation in each jurisdiction**

Australian Government — the *Privacy Act 1988* (Cwlth) requires Australian Government agencies to follow a set of eleven Information Privacy Principles, and private health care providers to comply with a set of ten National Privacy Principles. These are overseen by the Privacy Commissioner, who is also required under the *National Health Act 1953* (Cwlth) to issue guidelines on how Australian Government agencies manage individuals' Medicare and Pharmaceutical Benefits Scheme claims information. A breach of these guidelines constitutes a violation of the Privacy Act.

The Australian Bureau of Statistics and the Australian Institute of Health and Welfare are subject to confidentiality requirements under the *Census and Statistics Act 1905* (Cwlth) and *Australian Institute of Health and Welfare Act 1987* (Cwlth) respectively.

New South Wales — the *Health Records and Information Privacy Act 2002* (NSW) governs the handling of health information in the public sector, and it also seeks to regulate the handling of health information in the private sector. Privacy NSW has developed four statutory guidelines under this legislation, which are legally binding and define the scope of particular exemptions in the health privacy principles.

Victoria — the *Health Records Act 2001* (Vic) covers the handling of all personal information held by health service providers in the public sector and also seeks to govern practices in the private sector. The legislation contains a set of principles adapted from the National Privacy Principles.

Queensland — the *Information Privacy Act 2009* (Qld) contains nine principles specifying how the Department of Health is to handle personal information. These principles have some similarities to the National Privacy Principles in the Commonwealth Privacy Act.

South Australia — government agencies generally have to comply with a set of Information Privacy Principles issued under a Cabinet Administrative Instruction. There is also a Code of Fair Information Practice, which applies to the SA Department of Health, its funded service providers, and others with access to personal information held by the Department.

Western Australia — government agencies do not currently have a legislative privacy regime, but are subject to various confidentiality policies and some privacy principles are provided for in the *Freedom of Information Act 1992* (WA).

ACT — the *Health Records (Privacy and Access) Act 1997* (ACT) covers health records held in the public sector and seeks to apply to practices in the private sector not covered by the Commonwealth Privacy Act.

Northern Territory — the *Information Act 2002* (NT) covers the protection of personal information, record keeping and archive management of information held in the public sector. The Information Commissioner is responsible for overseeing the freedom-of-information and privacy provisions of the legislation.

Source: AIHW (2009); Office of the Privacy Commissioner (2009a, 2009b).

A common feature of the privacy and confidentiality arrangements is that responsibility for handling and releasing data is assigned to one or more 'data custodians' in the relevant organisation. In the Discussion Draft for this study, the Commission expressed the concern that the term custodian could imply the purpose is to hold data potentially from a range of users. A further concern is that the role of data custodians could be used to censor information that may highlight deficiencies in the provision of health services. However, the SA Department of Health noted that:

> The term data custodian is not one of restricting access but about appropriate governance and management of databases, many of which contain significant personal information. (sub. DR45, p. 5)

The NSW Department of Health observed that data custodians perform an important role in the public health system, with their key responsibilities including:

- ensuring that patient privacy is maintained
- ensuring compliance with data provision legislation, probity issues and other protocols (for example, protecting the commercial interests of private providers and obtaining any relevant consents required for the release of data)
- ensuring due consideration of any ethical issues associated with the use and release of data
- ensuring the completeness and accuracy of data to be released, or if necessary, providing specific caveats regarding the data to be released where there are issues relating to its completeness and/or accuracy. (sub. DR64, pp. 3–4)

Privacy and confidentiality requirements can be particularly problematic when the data necessary to compare public and private hospitals are not available from a single source. The Commission experienced this issue with its multivariate analysis, which required access to hospital-level data held by the Australian Bureau of Statistics (ABS) and the Australian Institute of Health and Welfare (AIHW), both of which are subject to legislative constraints on what data can be provided to external parties (box 1.2). An arrangement was found to allow the Commission's multivariate analysis to proceed, although this was not as straightforward as having direct access to the data.

Information collected by the ABS at considerable public expense is a valuable resource for Australia. There appears to be a case for reviewing existing requirements to enable sensible and measured use of these public data. This could include consideration of a protocol allowing access to data that does not breach privacy rules and meets certain public-interest requirements.

The Commission found that a major barrier to accessing data held by the AIHW was that the Institute had to obtain approval from jurisdictions that supplied the data, even when the information would not be released in a way that identified individual patients or hospitals.[2] The states and territories can use this power, as both providers of hospitals and collectors of hospital-related data, to ensure information is only provided to parties, and for purposes, they deem to be 'appropriate'. One way to address this conflict of interest would be to have a protocol between the AIHW and jurisdictions that placed greater onus on the AIHW to ensure individual data requests met the legislated privacy and confidentiality requirements of each jurisdiction. Delegating the approval of individual data requests to the AIHW should at least occur for cases where information would only be divulged to established data users, and in a form that does not identify individual patients or hospitals. The protocol would be subject to the AIHW's governance arrangements, which include state/territory representation on the AIHW management board.

The problem of aggregating data from more than one source, while also satisfying privacy and confidentiality requirements, has been a barrier to developing 'linked' datasets that can be used to measure the impact of health interventions on outcomes. The NSW Department of Health noted that many organisations would have to be involved, and significant community concerns addressed:

> For a range of reasons including the involvement of two levels of government as funders and regulators, as well as the involvement of another two sectors (commercial and not-for-profit) as providers, it is impossible to chart a patient's journey through the health system by analysing a 'data trail' because no such trail exists or can be constructed. The databases for MBS [Medicare Benefits Schedule] and PBS [Pharmaceutical Benefits Scheme] managed by Medicare Australia (access to which is extremely restricted) are entirely separate from the admitted and non-admitted databases maintained by states and territories, and also distinct from private hospital databases.
>
> … the community is logically uneasy about possible secondary uses of databases. This means that if the full benefits of data linkage are to be realised, it will be necessary to demonstrate the value to be gained by linking health activity data from different sources, and to be very clear about the 'rules' that will govern this process. (sub. DR64, p. 4)

Progress is, however, being made in this regard. At a national level, the Population Health Research Network (PHRN) has been established to provide researchers with access to linkable de-identified data from a diverse range of health datasets, across jurisdictions and sectors. The PHRN has been allocated significant funding from the Australian Government, in addition to contributions in cash and in-kind from state and territory governments, and academic partners. A data linkage system has

2 The requirement to get approval from states and territories before releasing data derives from s.29 of the *Australian Institute of Health and Welfare Act 2007* (Cwlth).

existed in Western Australia since the mid 1990s, with more than 600 research projects having made use of the data since that time. The SA Department of Health (sub. DR45) noted that it is a partner in the SA NT Data linkage Consortium that will provide project-specific deidentified data from a number of administrative and other datasets for research purposes. Similarly, the Centre for Health Record Linkage was established in 2006 to create and maintain a system for linking health and human services datasets in New South Wales and the ACT.

In summary, making hospital-related data more accessible to a broad range of users would facilitate greater research and analysis of hospitals. This could drive improvements in health care, especially as competitive markets have only a limited role in the health sector. The potential gains could be significant, given the substantial resources that Australia devotes to hospital services and the many people treated in hospital each year. Greater data accessibility could also facilitate future improvements in data collections by highlighting weaknesses in existing datasets.

The barriers to accessing hospital-related data are also wasteful because a substantial amount of information is currently collected at significant cost to governments and firms, and the potential broader public benefits from this are being unnecessarily curtailed.

Another way in which greater benefits might be achieved is for data agencies to strengthen mechanisms through which data users — including those outside of government, such as academics and private health insurance funds — can provide ongoing input on how hospital-related data are collected and made available for analysis and research. At the Commonwealth level, DOHA (sub. DR69) noted that it already has consultative groups for health insurers and private hospital operators.

FINDING 1.1

The Commission encountered significant delays in accessing hospital-related data beyond what could reasonably be expected to address privacy or confidentiality concerns. There is a case for making these data more accessible to a range of users because this could drive improvements in health care, especially as competitive markets only have a limited role in the health sector. It could also encourage future improvements in the data collections. Data agencies could facilitate greater data access by:

- *having established protocols allowing access to data that does not breach privacy rules and meets certain public-interest requirements*
- *strengthening the mechanisms through which data users can provide ongoing input on how data are collected and made available for analysis and research.*

FINDING 1.2

Information collected by the Australian Bureau of Statistics (ABS) at considerable public expense is a valuable resource for Australia. The Commission found that the ABS has a number of requirements that can restrict measured use of these public data, which the Commission suggests be reviewed by the Australian Government. There are also barriers to accessing data held by the Australian Institute of Health and Welfare (AIHW), due to a requirement to obtain approval from jurisdictions to release the data. This could be addressed by the states and territories delegating the approval of individual data requests to the AIHW, particularly where information would only be divulged to established data users and in a form that does not identify individual patients or hospitals.

1.4 Conduct of the study

The terms of reference for this study were received from the Assistant Treasurer on 15 May 2009. The Commission was originally to report within six months, but the Assistant Treasurer later extended the final reporting date to early December 2009 because the Commission had encountered delays in obtaining data needed to undertake the study, and some participants were late in lodging their submissions.

As requested in the terms of reference, the Commission consulted and invited feedback from relevant experts and other interested parties. This was done in the following ways:

- At the commencement of the study, a circular was mailed to people and organisations that the Commission thought might be interested, inviting their participation. Subsequent circulars were sent to those who had expressed an interest in the study to keep them updated on progress.
- The study was also advertised in major national newspapers and promoted on the Commission's website.
- The Commission met with a cross-section of interested parties to identify relevant issues and sources of data, including government health departments, private hospital groups, data agencies, and private health insurers.
- An issues paper was released on 22 June 2009 to assist interested parties in preparing submissions to the study.
- A roundtable was held with interested parties in Canberra on 30 June 2009 to explain the study process and obtain input on what data and methodology to use.

- A teleconference was held with technical experts from individual jurisdictions and private hospital groups on 17 September 2009 to obtain their views on how to interpret the cost data that they report to the Australian Government.
- The Commission released a Discussion Draft on 15 October 2009 to provide an opportunity for interested parties to comment on draft findings prior to completion of the Final Report.
- A further roundtable was held with interested parties in Canberra on 22 October 2009 to get feedback on the Discussion Draft.
- A teleconference was held with participants on 23 November 2009 to get their feedback on the results of the multivariate analysis.
- Two external referees provided written comments on the multivariate analysis (appendix G).

A total of 72 written submissions were received during the study. These were from a variety of groups, including government health departments, academics, private hospital groups, professional bodies, and private health insurers.

The Commission thanks study participants for meeting with the Commission, participating in roundtables and teleconferences, providing data and other assistance, and making written submissions. Appendix A provides details of the individuals and organisations that participated in the study.

2 Australia’s public hospital sector

Key points

- State and territory governments are assigned specific responsibilities in the delivery of public hospital services under the National Healthcare Agreement. These include the provision of free hospital (including emergency) services, with equitable access to all eligible persons regardless of geographic location, and a major role in clinical training. These responsibilities shape the volume and type of services that the public hospital sector can deliver.
- Australia currently has 768 public hospitals, which vary widely in size and location. However, most are small in size (with 50 beds or fewer) and most are located in regional areas.
- The main type of service provided by public hospitals is acute care, but their services extend to rehabilitation, palliative, geriatric, newborn and maintenance care. Around half of all public hospital separations are same-day admissions.
- Australia’s public hospitals treated over 4 million admitted patients in 2007-08. Over one-third of patients treated in public hospitals are aged 65 or older, and 14 per cent of patients in public hospitals elect to be treated as private patients.
- Almost three-quarters of public hospital patients are admitted for medical treatment while 20 per cent are admitted for surgery. The most common inpatient treatment in public hospitals is same-day renal dialysis.
- Public hospitals delivered over 48 million occasions of service to non-admitted patients in 2007-08, including 7.1 million accident and emergency presentations.
- Over the past four years, the number of beds per capita has remained stable, while waiting times for elective surgery and the volume of emergency cases have risen.
- Given that the delivery of public hospital services is the responsibility of the state and territory governments, Australia effectively has eight different public hospital systems. The differing needs and preferences of the states and territories lead to diversity in structure and service provision within the public hospital sector. Variations among the states and territories are observed with respect to the:
  - centralisation of governance
  - mix of diagnoses treated and the share of same-day and overnight admissions
  - demographic profile of patients and the proportion admitted as private patients
  - number of teaching hospitals
  - average salaries of public hospital staff.

The provision of public hospital services in Australia is founded on the principle that all persons eligible for Medicare are entitled to choose to receive health and emergency services free of charge as a public patient. The principle of public hospital provision, as well as the responsibilities and governance arrangements of the public hospital sector, are specified in the current National Healthcare Agreement (NHA) (and formerly in the Australian Health Care Agreements (AHCAs)).[1]

A public hospital is defined as one that is operated by, or on behalf of, the government of the state or territory in which it is established. This includes hospitals which are owned by private or charitable groups but are authorised or contracted by the government to deliver public hospital services (AIHW 2009c). Although the funding of public hospitals is shared between the Australian, state and territory governments, the delivery of public hospital services is the responsibility of each state and territory government. The decentralisation of management responsibility means that Australia effectively has eight different public hospital systems which reflect, at least partly, the different population needs, geography and resource capacity of each state and territory.

This chapter profiles the structure and activity of Australia's public hospital sector, including the types of services delivered, the characteristics of the patients treated, and the workforce of the sector. Recent developments in the public hospital sector are also reviewed.

2.1 Role and structure of public hospitals

Role of public hospitals

Public hospitals exist in order to fulfil the government's obligation to provide free hospital services to all members of the community who meet Medicare eligibility criteria. More broadly, governments have an incentive to provide public hospital services to reap the social benefits associated with the achievement of good health (such as higher workforce participation and productivity) and to minimise the social costs associated with poor health (such as the costs of infection outbreaks). More recently, the incentive for governments to provide public hospital services has been further driven by the community's growing expectations regarding accessibility to health services.

1 The NHA replaced the bilateral state and territory AHCAs from July 2009.

Under the NHA and former AHCAs, it is the responsibility of state and territory governments to ensure all residents have equitable access to hospital services, meaning that a broad range of hospital (including emergency) services should be available, free of charge, throughout each state and territory. In regions where it is not feasible for local hospitals to provide some types of acute care, patient travel and accommodation services are often provided. Since funding for public hospitals is sourced primarily from general taxation — rather than fees for services — the volume of public hospital services demanded must be managed within the given budget constraint. Excess demand for services cannot be rationed by price, but by non-price mechanisms such as waiting lists.

The service responsibilities assigned to public hospitals have implications for their allocation of resources. First, the obligation to provide emergency services means that a certain volume of resources must be permanently on standby in public hospitals which receive emergency cases. Many study participants noted that the need to divert resources to emergencies can severely interrupt and constrain the delivery of other hospital services such as elective surgery.

However, detailed analysis undertaken by the NSW Health Surgical Services Taskforce suggested that this is a symptom of inadequate management rather than an inevitable consequence of treating emergency cases:

> Our Taskforce has recently published the *Emergency Surgery Guidelines* … In preparation for this publication, extensive data analysis was conducted and concludes that emergency surgical admissions were entirely predictable and could be managed more effectively with a planned approach thereby minimising disruption to elective surgical services. It is a failure of adequate management of the emergency load that is the problem. (sub. DR43, p. 1)

Provision of emergency services can have resource implications for infection control because, as noted by the Australian Healthcare and Hospitals Association (AHHA, sub. 33), patients undergoing emergency procedures are at greater risk of infection.

Second, the responsibility of public hospitals to invest in clinical teaching and research — while important for the training of the future hospital workforce and the advancement of hospital practice — imposes additional resource costs on the public hospital sector. It is acknowledged, however, that a hospital's engagement in clinical teaching and research also generates potential benefits, as Bio21 Australia Limited noted:

> [T]he presence of any serious commitment to clinical research within a hospital or even of its staff having such a commitment elsewhere is likely to enhance the quality of professional service to patients. (sub. 35, p. 1)

Third, the responsibility assumed by governments to provide hospital services across all geographical regions means that a number of public hospitals are operating in regions where the degree of remoteness — and consequential small scale of operation — may make such establishments very costly to operate relative to the volume and type of services they can safely deliver. The Tasmanian Department of Health and Human Services commented on this point:

> Providing hospital care in rural and remote communities is almost entirely the domain of the public sector which must absorb the scale disabilities imposed by this community service obligation. (sub. 37, p. 3)

Additionally, public hospitals in some remote areas may take on the responsibility of providing other public health services, such as aged care and community health services, which would otherwise not be available in these regions.

Ownership and management

The provision of health and emergency services through the public hospital system is the responsibility of the state and territory governments (COAG 2008d). State and territory governments typically divide the management of public hospitals along geographical lines (for example, metropolitan, regional and rural services), with a separate division generally established for ambulance services. In many jurisdictions, management structures have undergone frequent revision. For example, the number of health service districts in Queensland has been progressively reduced from 38 to 15 over recent years.

The degree to which the governance of public hospitals is centralised, however, varies widely among the states and territories, as noted by the Australian Government Department of Health and Ageing (DOHA, sub. 32). For example, public hospitals in New South Wales lie within eight area health services which report directly to the NSW Department of Health. In contrast, the governance of public hospitals in Victoria is more decentralised, with hospitals, or networks of hospitals, reporting to their own boards.

In some instances, governments facilitate the delivery of public hospital services by contracting or authorising a private company to build or operate a hospital establishment. In this type of arrangement, the hospital is privately owned but classified as a public hospital because it operates on behalf of the government. Examples of privately-owned government-contracted hospitals include Mercy Women's Hospital (Victoria), Noosa Hospital (Queensland) and Joondalup Hospital (Western Australia). In some of these arrangements, public hospitals may be managed under the auspices of denominational groups (in many cases, Catholic religious orders) (DOHA, sub. 32).

Public hospital services can also be delivered in partnership with the private sector when private companies build private hospitals on public hospital campuses. These co-location arrangements allow for the shared use of infrastructure and facilitate teaching and research. Examples include the Jessie McPherson Private Hospital co-located with Monash Medical Centre (Victoria), Flinders Private Hospital co-located with Flinders Medical Centre (South Australia), and Holy Spirit Northside Hospital co-located with Prince Charles Hospital (Queensland). A private hospital co-located in a public establishment is not classified as a public hospital.

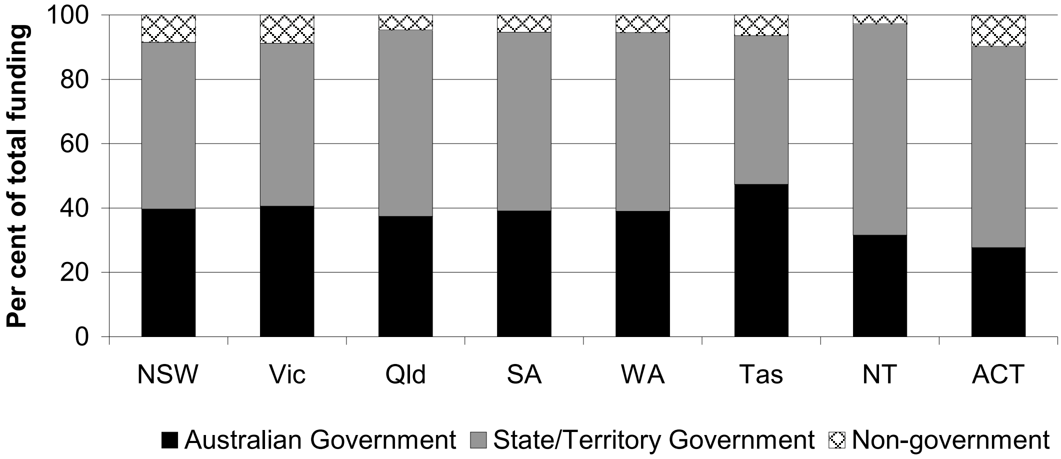
Funding arrangements

Although the delivery of public hospital services is the responsibility of the state and territory governments, funding is provided by both the federal and state or territory tiers of government.[2] Non-government sources, such as insurance funds and patients' out-of-pocket payments, also fund a small portion of public hospital services.

On average, the state and territory governments provide around 53 per cent of funding for public hospital services, while the Australian Government provides around 40 per cent and non-government sources contribute around 7 per cent (figure 2.1). However, there are variations between jurisdictions. In particular, funding in the Northern Territory and the ACT is more heavily sourced from the territory government, while funding in Tasmania is more heavily sourced from the Australian Government, relative to the average funding shares of all jurisdictions. The contribution of non-government sources also varies widely, comprising as high as 10 per cent of total funding in the ACT and Victoria, but no more than 4 per cent of total funding in Queensland, South Australia and the Northern Territory.

2 Public hospital services exclude dental services, community health services, patient transport services, public health, and health research undertaken by the hospital, but can include services provided away from the hospital site such as dialysis (AIHW 2009a).

Figure 2.1 **Funding sources for public hospital services, 2007-08**



Source: AIHW (2009c).

Public hospital services constitute the largest item of total health expenditure for the state and territory governments, and the second-largest for the Australian Government. Between 2003-04 and 2007-08, the collective share of government funding coming from the states and territories increased, although the share of total public hospital funding from government sources declined (AIHW 2009c). Most of the Australian Government's expenditure on public hospitals is in the form of funding conferred to the state and territories through the NHA and formerly the AHCAs (AIHW 2009c).

In all states and territories except for the ACT, funding for acute inpatient services is distributed at least partly on the basis of a casemix scheme. Under casemix and similar activity-based funding schemes, each hospital is funded in relation to the types of services it provides as well as the severity of patients' conditions — factors that are indicative of the hospital resources required. Among the states that adopt casemix funding, all except for Western Australia use the AR-DRG (Australian Refined Diagnosis-Related Group) classification system to define the casemix. Victoria was the first jurisdiction to implement casemix funding in 1993, while Queensland was the most recent in 2007. New South Wales uses a two-tiered funding model, incorporating an activity-based funding component for specified admitted activity (NSW Department of Health, sub. DR64). In some states, particularly Victoria and South Australia, casemix funding is also applied to sub-acute and outpatient hospital services (Hurley et al. 2009). Across most jurisdictions, grant (or per day) funding is used for certain types of acute care where casemix funding is deemed unsuitable, such as mental health or intensive care. Some states supplement the casemix funding received by small hospitals in regional and remote areas. For example, South Australia designates 35 country hospitals as 'minimum volume hospitals' and provides an additional $115 million for their budget (SA Health, sub. 4, p. 2). In the ACT, the small scale of the public hospital sector means that budgets are largely allocated on the basis of historic costs.

Casemix and similar activity-based funding schemes are designed to promote operational efficiency in the delivery of hospital services. Among other advantages, casemix funding schemes:

- offer a way to link funding to the services delivered
- facilitate an assessment of hospital performance benchmarks and a comparison of similar or peer hospitals
- enable managers and clinicians to identify inefficiencies in the system and reallocate resources appropriately (Hurley et al. 2009; NHHRC 2009).

2.2 Characteristics of public hospitals

Traditionally, Australia's public hospital sector has been typified by large, metropolitan establishments, whose explicit role was to provide acute medical care, including emergency services and complex specialist procedures, as well as to undertake the clinical research and training needed to sustain the hospital sector. A number of major teaching hospitals in capital cities still reflect this service approach.

However, it is evident that the role and features of public hospitals are changing over time, as the sector adapts to the changing needs and characteristics of the population, and as private hospitals adopt some of the functions traditionally reserved for the public sector (such as the provision of emergency services and clinical training). As Australia's hospitals continue to evolve, there are now many public hospitals that do not typify the traditional public hospital establishment, just as there are now many private hospitals that resemble public hospital establishments.

The location, size and service characteristics of Australia's public hospitals are now driven, in part, by the obligation borne by the state and territory governments to provide all residents with equitable access to hospital care (COAG 2008d). The existing profile of the public hospital sector, therefore, is very much shaped by the demographic profile of Australia's population, as well as historical trends underlying population growth and patterns of regional dispersion.

Number and activity of public hospitals

The most recently available data from DOHA indicate that there are currently 768 acute and psychiatric public hospitals in Australia.[3] Hospital activity for admitted patients is commonly measured in terms of separations, as explained in box 2.1.

> **Box 2.1 Measures of hospital activity**
>
> Data on hospital care are generally reported in terms of *separations*. A separation refers to an episode of care administered to an admitted patient, which ends by either discharge, death, transfer to another hospital or change in the type of care. During a hospital admission, a single patient may receive more than one episode of care — and therefore undergo more than one separation — if they transfer to another hospital or change their type of care (for example, from acute care to rehabilitation).
>
> Separations only apply for patients who are admitted to hospital. Data on separations therefore exclude patients who are treated in emergency departments or receive outpatient services as a non-admitted patient. Care administered to patients in emergency departments is reported in terms of *presentations*. Care administered to all other non-admitted patients is reported in terms of *occasions of service*.

Australia's public hospitals recorded over 4 million separations in 2007-08 (table 2.1). Half of Australia's public hospitals are located in New South Wales and Victoria, reflecting these states' high population shares. Between them, these two states recorded the majority of separations (60 per cent) in Australia's public hospital sector. In per capita terms, however, the Northern Territory recorded the highest volume of admitted patient public hospital activity by a considerable margin, recording 486 separations per 1000 residents in 2007-08. This compares to the next highest rate of 256 separations per 1000 residents reported by the ACT. The lowest rates of separations per capita were administered in Tasmania and Queensland (184 and 196 separations per 1000 residents respectively).[4]

---

3 The data reported in this chapter refer to different time periods due to differences in data availability. The most recently available data on the total number and location of public hospitals are for September 2009 (DOHA 2009e). The most recently available data on public hospital separations, services and expenditure are for 2007-08 (AIHW 2009a, 2009c). Psychiatric hospitals are not included in the Commission's analysis due to the specialised nature and duration of psychiatric treatment and the difficulty of apportioning costs over time, but are commonly aggregated with acute hospitals in data collections.

4 The data does not capture the extent to which hospitals treat patients outside of their jurisdictions. Cross-border patient flows occur within all jurisdictions (AIHW 2009a). In particular, however, ACT Health (sub DR52) noted that 25 per cent of separations reported for ACT public hospitals are for New South Wales residents.

Table 2.1 **Number and activity of public hospitals, 2007-08[a]**

	Number of hospitals	*Number of separations*	*Number of separations per 1000 residents*	*Proportion same-day separations*[b]
New South Wales	228	1 466 737	203	44
Victoria	148	1 351 172	248	57
Queensland	177	831 965	196	49
South Australia	80	368 330	216	45
Western Australia	94	458 202	215	51
Tasmania	27	96 270	184	53
Northern Territory	5	90 258	486	62
ACT[c]	3	81 127	256	54
Australia	**762**	**4 744 061**	**218**	**50**

[a] Acute and psychiatric hospitals. [b] Measured as a per cent of total separations. The remaining share of separations are overnight. [c] ACT Health (sub. DR52) advised that these data only include separations from the ACT's two major public hospitals.

Source: AIHW (2009a).

On average, half of all separations recorded by Australia's public hospitals are same-day admissions, while the remaining are overnight. Yet, some degree of variation is evident among the states and territories. Overnight admissions are more common in New South Wales and South Australia, while same-day admissions are more common in Victoria, Tasmania, the ACT and, in particular, the Northern Territory where over 60 per cent of all separations are same-day.

Size of public hospitals

Public hospitals vary widely in size: the majority have 50 beds or fewer, yet around 10 per cent have over 200 beds (table 2.2). Tasmania, South Australia, Western Australia and Queensland have the highest concentrations of small-scale hospitals: over 80 per cent of hospitals in each of these states have no more than 50 beds. In contrast, the Northern Territory and the ACT have relatively higher concentrations of large-scale hospitals, although they have fewer hospitals in total.

Table 2.2 **Number of public hospitals by size, 2007-08[a]**

	0–50 beds	*51–100 beds*	*101–200 beds*	*Over 200 beds*
New South Wales	149	29	23	27
Victoria	90	21	19	18
Queensland	142	11	10	14
South Australia	65	6	2	7
Western Australia	73	5	8	8
Tasmania	24	–	1	2
Northern Territory	2	1	1	1
ACT	1	–	–	2
Australia	**546**	**73**	**64**	**79**

[a] Acute and psychiatric hospitals. – Nil.

Source: AIHW (2009a).

Hospital size has implications for resource efficiency and reported cost differentials. Compared to large hospitals, small hospitals are less likely to be able to take advantage of economies of scale or reallocate their resources when workflows vary, thereby appearing relatively less efficient. At the same time, however, large hospitals may be constrained in their utilisation of resources due to the requirement that a certain level of capacity be reserved for emergencies. Large hospitals are also likely to treat a higher share of more complex — and therefore more costly — cases that are referred to them by smaller hospitals that are unequipped to treat the cases themselves. Queensland Health observed that this is a particular characteristic of the public hospital sector:

> [T]here can be significant difference in the types of cases treated at different hospitals … [T]he most complex cases are typically not undertaken in medium sized regional hospitals or private hospitals but are referred to the major (generally public) hospitals in large metropolitan centres. As such, the major tertiary hospitals will on average treat high complexity (and hence higher cost) cases within any given DRG [Diagnosis-Related Group] than regional hospitals or private hospitals. (sub. 27, p. 2)

Location of public hospitals

Public hospitals are widely dispersed geographically. Almost one-quarter of Australia's public hospitals are located in major cities, and a slightly smaller share are located in remote areas, yet the majority are located in regional areas (table 2.3). Exceptions are observed in the ACT, where all public hospitals are located in Canberra, and in the Northern Territory, where the majority are in remote areas. Queensland and Western Australia also have relatively high concentrations of public hospitals in remote areas. This pattern of dispersion reflects the share of each state or territory's population living outside of major cities.

Table 2.3 **Number of public hospitals by location, 2009[a]**

	Major cities	*Inner regional*	*Outer regional*	*Remote*	*Very remote*	*All locations[b]*
New South Wales	63	80	61	13	5	224
Victoria	56	57	36	2	..	151
Queensland	18	33	66	24	53	197
South Australia	12	15	27	14	5	73
Western Australia	12	8	28	23	14	85
Tasmania	..	12	15	1	2	30
Northern Territory	..	..	1	2	2	3
ACT	3	–	..	..	..	5
Australia	**164**	**205**	**234**	**79**	**81**	**768**

[a] Acute and psychiatric hospitals. Location based on ABS (2001) Australian Standard Geographical Classification. [b] Includes two public hospitals in New South Wales and three public hospitals in Queensland that are unable to be geographically classified due to missing postcode data. **..** Not applicable (state or territory does not contain the respective type of area). – Nil.

Source: DOHA (2009e).

The obligation for state and territory governments to provide all residents equitable access to public hospital services has particularly significant implications for highly regionalised states, such as Queensland and Western Australia, and to a lesser degree, South Australia, New South Wales and the Northern Territory. As noted by DOHA (sub. 32), the distance of hospitals from metropolitan and regional centres can affect estimated measures of hospital performance. For example, hospitals in remote areas are likely to incur a higher cost of transporting hospital supplies as well as greater difficulty attracting staff, which may necessitate higher wages. Furthermore, some hospitals in remote areas have an added responsibility to provide primary health and aged care services, which would otherwise not be provided in their areas. Additionally, as noted by Queensland Health (sub. 27), many regional and remote hospitals are very small in capacity, and therefore unable to benefit from economies of scale. ACT Health (sub. DR52) noted that relatively higher costs are incurred when jurisdictions provide a full range of hospital services for a small population. The SA Department of Health acknowledged the responsibility held by each of the state and territories governments, and the implications this bears for the operating efficiency of public hospitals:

> Public hospitals have an obligation to provide all Australians who present to them with free public hospital care and access to services based on clinical need. Public hospital access also needs to be provided across the state to ensure reasonable access to hospital care by residents. This means providing the full range of specialist inpatient, outpatient, emergency and diagnostic services at all times. For South Australia, it also means operating minimum volume hospitals in country areas. Due to size and location, such country hospitals are often relatively expensive to operate, but their importance to communities cannot be underestimated. (sub. 4, p. 2)

The number of beds available per capita also appears to vary according to location. On average, Australia's public hospitals provide 2.7 beds per 1000 residents, but higher bed ratios are reported in New South Wales and South Australia, while lower bed ratios are reported in Victoria, Tasmania and the ACT (table 2.4).

Table 2.4 **Number of public hospital beds per 1000 residents by location, 2007-08[a]**

	Major cities	*Inner regional*	*Outer regional*	*Remote*	*Very remote*	*All locations*
New South Wales	2.7	3.3	3.9	7.7	7.6	2.9
Victoria	2.4	2.7	2.9	2.9	..	2.5
Queensland	2.3	2.5	3.4	4.0	6.4	2.6
South Australia	2.8	2.4	5.0	7.7	7.5	3.2
Western Australia	2.6	1.8	3.5	3.3	3.1	2.6
Tasmania	..	3.1	1.5	2.9	3.5	2.6
Northern Territory	..	–	2.9	5.0	1.0	2.9
ACT	2.6	–	..	..	..	2.5
Australia	**2.5**	**2.8**	**3.4**	**4.8**	**4.0**	**2.7**

[a] Acute and psychiatric hospitals. Location based on ABS (2001) Australian Standard Geographical Classification. **..** Not applicable (state or territory does not contain the respective type of area). – Nil.

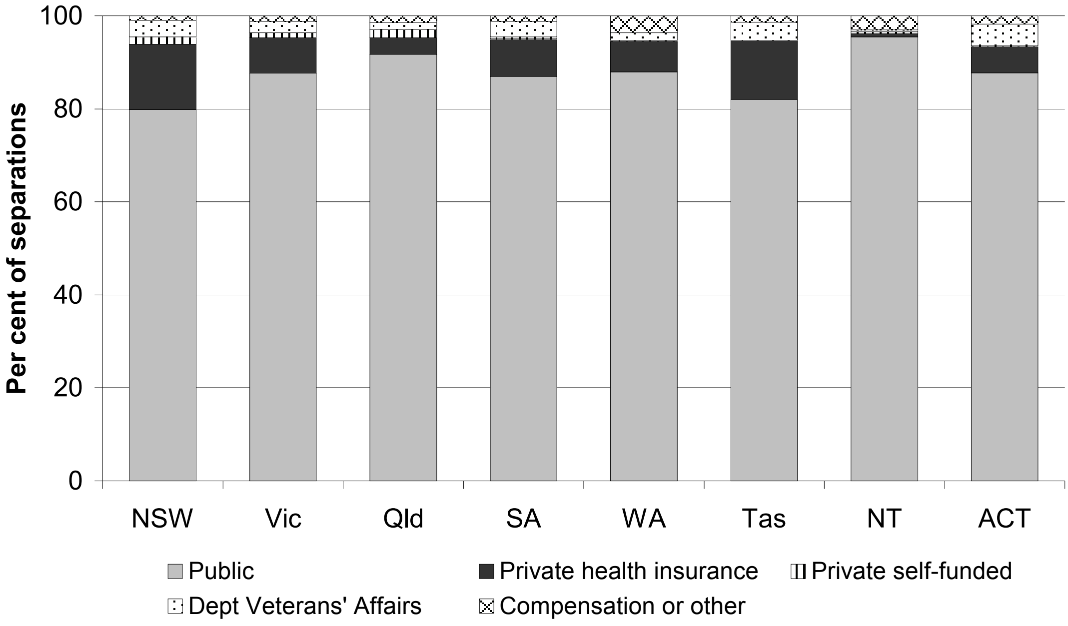
Source: AIHW (2009a).

A general feature of most states and territories is that more beds per capita are available in remote or very remote areas than in major cities or regional areas. However, this ratio still varies widely. In remote or very remote areas, there are at least seven public hospital beds available per 1000 residents in New South Wales and South Australia, while there are no more than 4 public hospital beds available per 1000 residents in Victoria, Tasmania and Western Australia.

Patients in public hospitals

Although public hospitals primarily treat public patients, they also treat patients who elect private status, entitling them to a choice of doctor and/or the offer of private ward accommodation. About 14 per cent of public hospital separations in 2007-08 were for patients electing private status, most of whom were funded by private health insurance (figure 2.2). New South Wales and Tasmania had the highest proportion of patients being treated and billed as private patients in their public hospitals (20 and 18 per cent respectively), while the Northern Territory and Queensland had the lowest (5 and 8 per cent respectively).

Figure 2.2 **Share of public hospital separations by patient funding source, 2007-08[a]**



a Acute and psychiatric hospitals. The share of self-funded patients may be underestimated as some are unable to be identified. *Compensation or other* includes workers compensation, other compensation, motor vehicle third party personal claims, other public authorities, and other funding sources. Data exclude patients whose funding source is not reported.

Source: AIHW (2009a).

The demographic profile of patients treated in public hospitals is generally similar across the states and territories (table 2.5). Around one-third of patients treated in public hospitals are aged 65 and older. An exception is the Northern Territory which has a relatively lower proportion of patients aged 65 and older, balanced by a relatively higher proportion of patients aged 35 to 64. This point of difference reflects the Northern Territory's distinctly lower share of residents aged 65 and older in its population (ABS 2008a).

The public hospital sector treats a disproportionately larger share of patients of relatively low socioeconomic status. Fifty per cent of public hospital patients come from the lowest 40 per cent of the population on a scale of socioeconomic advantage (figure 2.3).

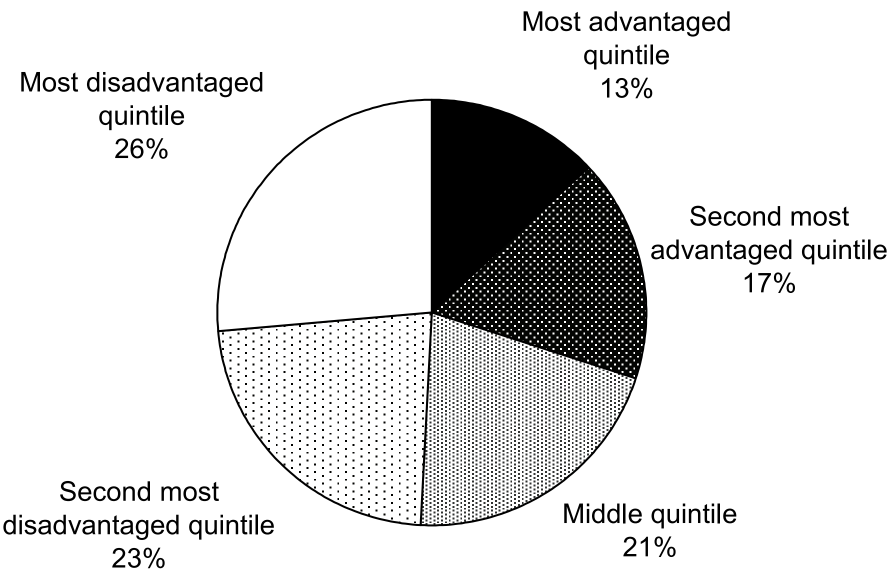
Table 2.5 **Public hospital separations by patient profile, 2007-08[a]**

	Males				*Females*			
	0–14	*15–34*	*35–64*	*65 & over*	*0–14*	*15–34*	*35–64*	*65 & over*
NSW	5.8	6.0	16.9	19.7	4.2	11.8	16.1	19.6
Vic	4.9	5.8	18.4	20.1	3.5	11.4	18.4	17.5
Qld	6.1	7.1	19.3	16.4	4.5	14.2	18.1	14.5
SA	5.6	6.0	17.6	19.5	4.1	12.1	17.1	18.1
WA	5.3	6.3	19.6	17.6	3.8	12.2	18.7	16.4
Tas	4.5	6.4	19.4	18.1	3.2	12.2	19.9	16.2
NT	5.2	6.3	26.1	7.3	3.9	12.8	31.8	6.7
ACT	4.8	7.1	20.4	19.8	3.2	11.4	16.8	16.5
Australia	**5.5**	**6.2**	**18.3**	**18.8**	**4.0**	**12.2**	**17.8**	**17.3**

[a] Acute and psychiatric hospitals. Per cent of total separations in each state or territory, according to patient's sex and age group. Each row sums to 100 per cent.

Source: AIHW (2009a).

Figure 2.3 **Share of public hospital separations by socioeconomic status of patients, 2007-08[a]**



[a] Quintile of socioeconomic status based on ABS (2008f) Index of Relative Socioeconomic Advantage/Disadvantage based on the patient's area of usual residence.

Source: AIHW (2009a).

Socioeconomically disadvantaged groups experience more ill health and have a risk factor profile consistent with their poorer health status (Turrell et al. 2006). As the public hospital sector treats a disproportionately large share of people of low socioeconomic status, patients treated in public hospitals are likely to be characterised by a relatively poor pre-existing health status and relatively more health-related risk factors. These factors affect not only the type of treatment sought, but also the resources required to undertake any given procedure. For example, patients with comorbidities or chronic conditions may be more susceptible to infection or unplanned readmission.

2.3 Services provided by public hospitals

Admitted patient services

The main type of service provided to patients admitted to public hospitals is acute care, which constitutes over 90 per cent of public hospital separations (table 2.6). The next most common type of service is newborn care, followed by rehabilitation. This distribution is generally consistent across the states and territories.

Table 2.6 **Number of public hospital separations by type of care, 2007-08[a]**

	Acute care	*Newborn*	*Rehabilitation*	*Palliative care*	*Geriatric*[b]	*Maintenance care*[c]
NSW	1 409 636	77 326	25 954	8 273	2 813	6 065
Vic	1 305 676	55 476	13 400	5 128	13 033	870
Qld	794 041	44 600	16 853	4 266	1 037	5 778
SA	353 543	15 014	6 884	1388	460	2 341
WA	441 410	22 023	8 496	1 392	1 273	2 211
Tas	93 173	3 933	1 141	268	53	589
NT	88 197	3 341	469	311	77	404
ACT	75 465	3 955	2 249	572	561	1 283
Australia	**4 561 165**	**225 668**	**75 446**	**21 598**	**19 307**	**19 211**

[a] Acute and psychiatric hospitals. Excludes other and not reported care types. [b] Includes geriatric evaluation and management, and psychogeriatric care. [c] Maintenance care refers to the provision of accommodation and nursing care as a service itself. This can include respite care, care to patients awaiting placement, and care to inpatients designated as nursing home type, but excludes residential aged care. – Nil.

Source: AIHW (2009a).

More specifically, the type of services provided to admitted patients can be categorised according to patients' diagnoses. Box 2.2 explains the common system by which patients' diagnoses are classified in Australia.

Box 2.2 **Australian Refined Diagnosis-Related Group (AR-DRG)**

The Australian Refined Diagnosis-Related Group (AR-DRG) system categorises separations according to the patient's condition and the hospital resources expected to be used. The system provides a way to record the number and type of separations administered by a hospital in relation to the resources required.

Version 5.1 of the classification system defines 665 individual AR-DRGs. Each separation is assigned to an AR-DRG mainly on the basis of the medical diagnosis or surgical procedure involved, but also according to a patient's age, length of stay, mode of separation, the level of clinical complexity and the existence of complicating diagnoses or procedures.

Individual AR-DRGs are grouped under 23 Major Diagnostic Categories (MDCs) which are mostly defined by body system or disease type.

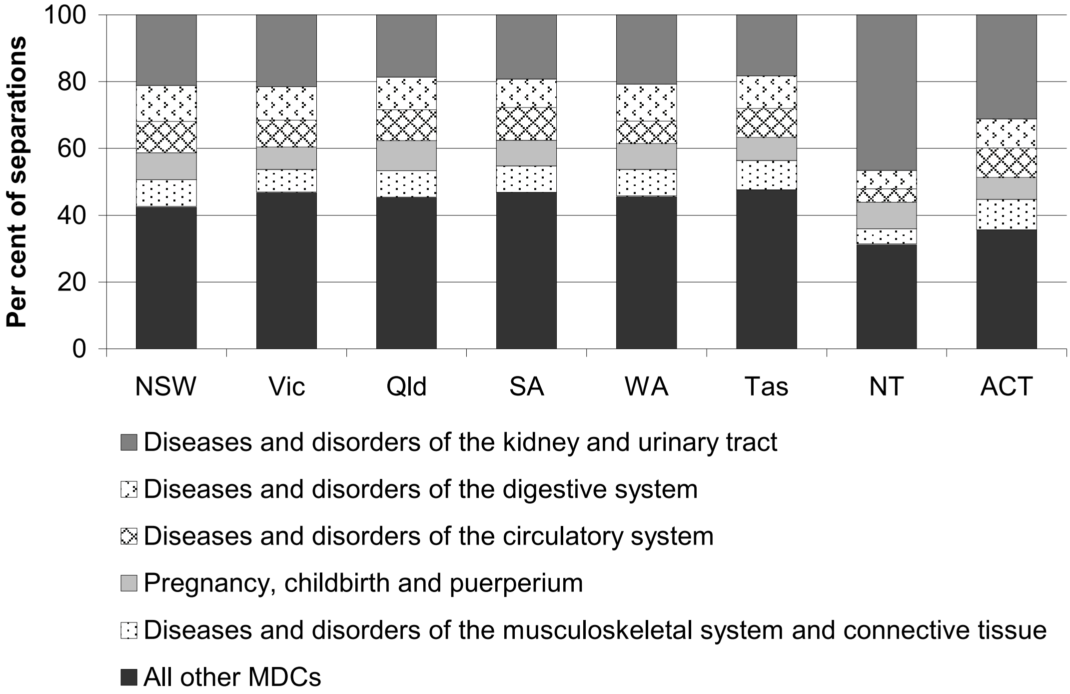
Within each MDC, individual AR-DRGs are assigned to a 'surgical', 'medical' or 'other' partition on the basis of the type of treatment involved. A separation is classified as surgical if it includes an operating-room procedure, medical if it does not include any type of procedure, and other if it includes a procedure performed outside of an operating room (such as dental extractions and colonoscopies). In this context, a procedure is defined as a clinical intervention that carries a procedural or anaesthetic risk, and/or requires specialised training, facilities or equipment available only in an acute-care setting.

Source: AIHW (2009a); DOHA (2004).

Among admitted patients, the most frequent type of diagnosis handled by Australia's public hospitals is a disease and disorder of the kidney or urinary tract (figure 2.4). This type of diagnosis comprises 21 per cent of all separations nationally, although the Northern Territory reports a considerably higher rate of 47 per cent of separations in this jurisdiction. The next most frequent types of diagnoses treated by Australia's public hospitals are diseases and disorders relating to the digestive, circulatory and musculoskeletal systems and separations relating to pregnancy and childbirth.

More broadly defined, medical cases comprise the majority (74 per cent) of separations handled by public hospitals nationally (figure 2.5). Surgical procedures comprise 20 per cent, while non-operating room procedures (classified as 'other') comprise the remaining 6 per cent. This pattern of distribution is generally consistent across the states and territories, with the notable exception of the Northern Territory which handles relatively more medical and fewer surgical cases than the national average.

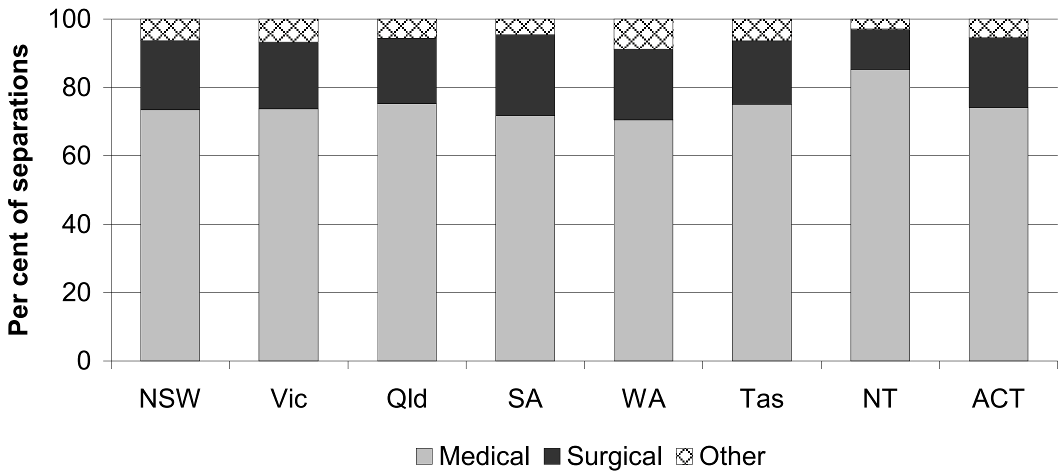
Figure 2.4 **Share of public hospital separations by MDC, 2007-08[a]**



[a] Acute and psychiatric hospitals. Per cent of total separations in each state or territory according to Major Diagnostic Category (MDC) as defined in AR-DRG version 5.1 (box 2.2).

Source: AIHW (2009a).

Figure 2.5 **Share of public hospital separations by AR-DRG partition, 2007-08[a]**

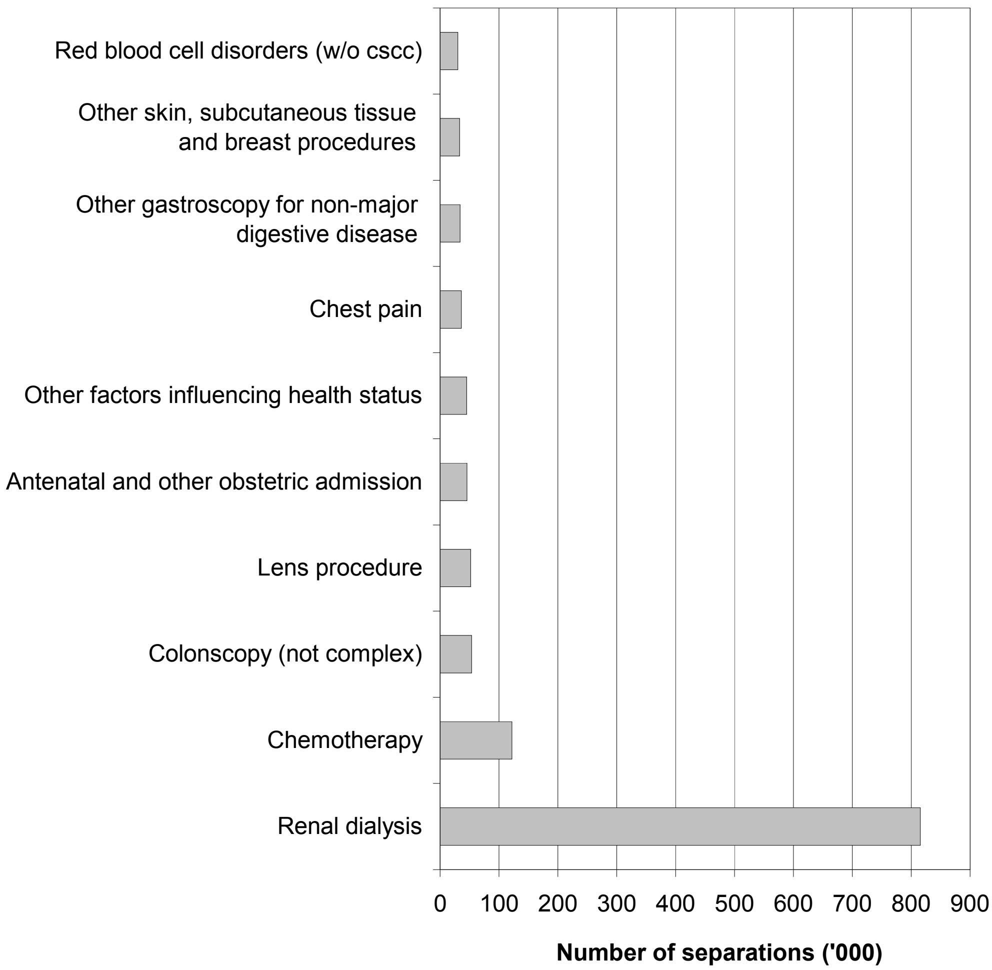


[a] Acute and psychiatric hospitals. Per cent of total separations in each state or territory as defined in AR-DRG version 5.1 (box 2.2).

Source: AIHW (2009a).

The predominance of medical cases — and the specific frequency of kidney and urinary tract diseases and disorders — can be largely attributed to the high number of same-day renal dialysis admissions handled by the public hospital sector. This type of admission is the most frequent type of separation treated by public hospitals, constituting one-third of same-day separations and 18 per cent of separations in total (figures 2.6 and 2.7).[5] The predominance of medical cases may also be explained by the high number of obstetric separations handled by the public hospital sector, which are also largely classified as medical cases.

Figure 2.6 **Most frequent same-day public hospital separations by AR-DRG, 2007-08[a]**

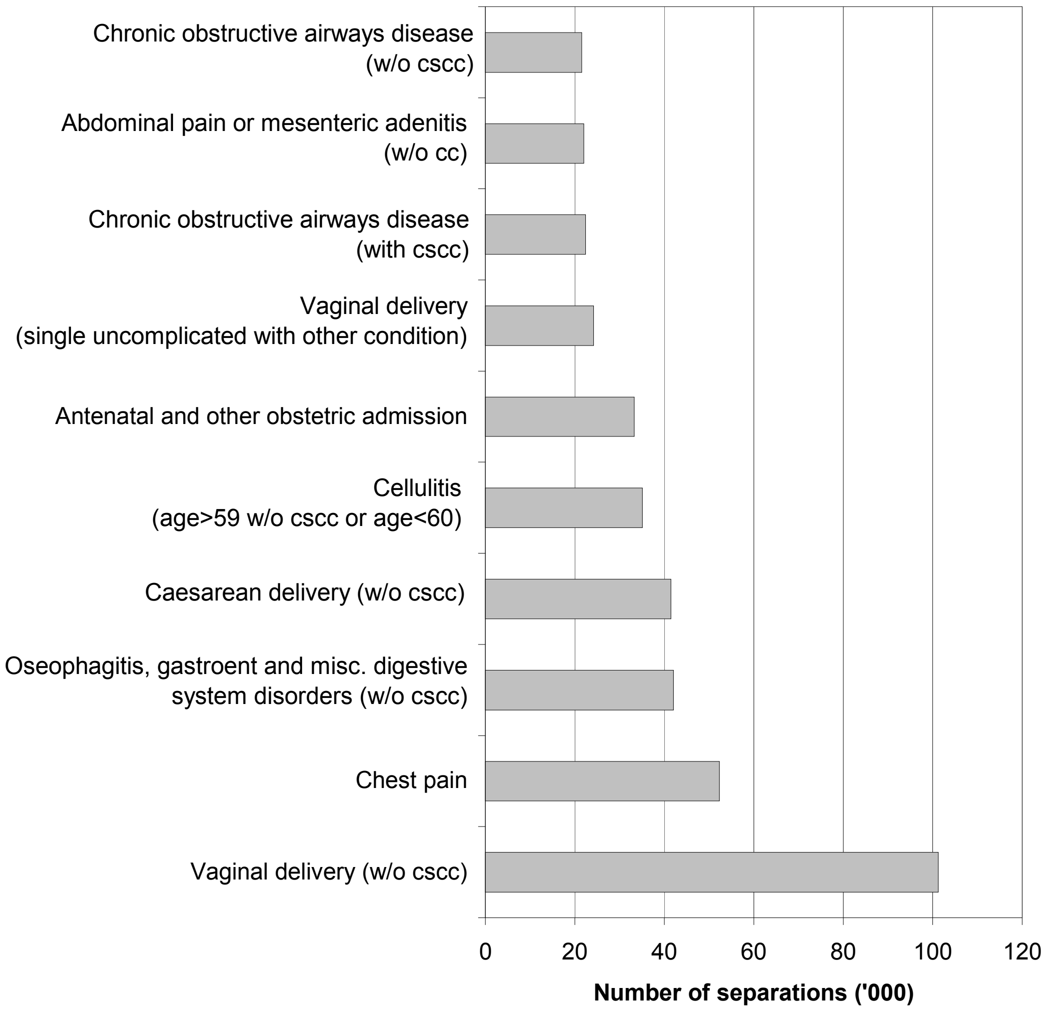


[a] Acute and psychiatric hospitals. Ten most frequent same-day separations, as defined in AR-DRG version 5.1 (box 2.2). w/o: without. cc: complications and comorbidities. cs: catastrophic or severe.

Source: AIHW (2009a).

5 The Australian Private Hospitals Association (APHA sub. DR65) suggested that the high number of same-day renal dialysis cases handled in the public sector may be due to some health insurance funds capping the benefits payable for renal dialysis. It is also acknowledged that a renal dialysis patient typically undergoes multiple same-day admissions as part of their ongoing treatment (NSW Department of Health, sub. 40).

Figure 2.7 **Most frequent overnight public hospital separations by AR-DRG, 2007-08[a]**



[a] Acute and psychiatric hospitals. Ten most frequent overnight separations, as defined in AR-DRG version 5.1 (box 2.2). w/o: without. cc: complications and comorbidities. cs: catastrophic or severe. misc.: miscellaneous.

Source: AIHW (2009a).

Another feature of Australia's public hospitals is their range of specialist units. The most common specialist unit in acute public hospitals is domiciliary care (assisting people with reduced ability to care for themselves in their own homes), followed by obstetrics and maternity facilities, and nursing home care (table 2.7). At the state or territory level, domiciliary care constitutes the most common specialist service in New South Wales, Victoria, Western Australia and South Australia, whereas obstetrics and maternity facilities constitute the most common specialist service in Queensland, Tasmania, the Northern Territory and the ACT. New South Wales provides a relatively large share of less common specialist services, having 75 of

Australia's 108 alcohol and drug units, 46 of Australia's 109 coronary care units, and 36 of Australia's 75 level-three intensive care units (AIHW 2009a).

Table 2.7 **Number of specialist service units in public hospitals, 2007-08[a]**

	Dom	*Obs*	*Nurs*	*Ren*	*Ger*	*Rehab*	*Psych*	*Hspice*	*Paed*	*Oncon*
NSW	158	78	73	56	71	58	45	45	46	43
Vic	96	58	77	59	35	32	35	24	30	36
Qld	39	40	13	23	10	18	18	9	18	11
SA	47	31	43	14	12	9	9	16	8	8
WA	58	32	39	12	22	19	18	29	9	10
Tas	–	2	–	2	3	3	3	1	3	3
NT	1	5	–	4	–	2	3	1	2	–
ACT	–	2	–	1	2	2	2	1	2	2
Australia	**399**	**248**	**245**	**171**	**155**	**143**	**133**	**126**	**118**	**113**

[a] Ten most common specialist service units in acute public hospitals in Australia. *Dom*: Domiciliary care service. *Obs*: Obstetrics and maternity facility. *Nurs*: Nursing home care unit. *Ren*: Maintenance renal dialysis centre. *Ger*: Geriatric assessment unit. *Rehab*: Rehabilitation unit. *Psych*: Psychiatric ward or unit. *Hspice*: Hospice care unit. *Paed*: Specialist paediatric unit. *Oncon*: Oncology unit. – Nil.

Source: AIHW (2009a).

Non-admitted patient services

In addition to treating admitted patients, public hospitals provide a considerable volume of services to non-admitted patients. The AIHW (2009a) reported that public hospitals administered over 48 million occasions of service to non-admitted patients in 2007-08, including 7.1 million accident and emergency presentations (table 2.8). The provision of emergency services fulfils the responsibility assigned to public hospitals under the NHA and former AHCAs.

Reported data on non-admitted patient services, however, are subject to wide variation in methods of collection and classification among the states and territories. For example, data reported by New South Wales under 'other individual patient care' include a large volume of pharmacy and district nursing services administered by Justice Health that would not typically occur in other hospitals. As the AIHW (2009a) cautioned, such variations preclude direct comparisons from being made.

Table 2.8 **Services to non-admitted patients in public hospitals, 2007-08**[a]

	Accident and emergency	*Outpatient care*	*Other individual patient care*[b]	*Group sessions*
New South Wales	2 417 721	6 400 364	12 414 382	242 174
Victoria	1 522 573	2 864 208	3 115 414	23 016
Queensland	1 471 377	3 324 742	5 867 454	17 853
South Australia	544 439	1 203 133	456 785	80 296
Western Australia	778 119	1 697 777	2 287 313	63 456
Tasmania	142 633	459 539	399 480	..
Northern Territory	125 315	296 259	194 087	300
ACT	98 441	122 694	150 878	1 756
Australia	**7 100 618**	**16 368 716**	**24 885 793**	**428 851**

[a] Reported number of occasions of service to non-admitted patients in acute public hospitals. Due to widespread differences in the collection and coverage of non-admitted patient data among the states and territories, the AIHW advises that the reported data should be interpreted and compared with caution. [b] Other types of care include: mental health, alcohol and drug, pharmacy, community health, district nursing, pathology, radiology and organ imaging and other outreach services. There are large variations in the types of care reported in this category by each of the states and territories. **..** Not applicable.

Source: AIHW (2009a).

As another broader point of difference in data reporting, a patient receiving a given type of treatment may be classified as an admitted patient in one jurisdiction, but as an non-admitted outpatient in another jurisdiction. For example, most chemotherapy patients are classified as non-admitted outpatients in New South Wales, South Australia and the ACT, but classified as admitted patients in other jurisdictions (AIHW 2009a). This point of difference must be considered when evaluating not only the volume of services reported for non-admitted patients, but also the volume of separations reported for admitted patients.

Data on hospital services delivered to non-admitted patients are further complicated by differences among the states and territories in the delivery of services to non-admitted patients outside of hospital settings. For example, outpatient hospital services delivered in community health centres by some states and territories are effectively excluded from reported hospital statistics (AIHW 2009a).

Research and training

Medical and health services research has traditionally been undertaken in public hospitals, and research remains an important function of the public sector. Likewise, under the NHA and former AHCAs, it is the responsibility of state and territory governments to provide clinical training for undergraduate students and specialists-in-training (COAG 2008d). DOHA commented on the value of this training role:

> Public hospitals play a vital role in all health professional training programs by providing clinical placements and supervision. For medical education, on completion of university undergraduate or graduate education programs, graduates enter pre-vocational training [for one year] at a major public teaching hospital to become registered to practice. Most registered doctors then also complete another one to two years pre-vocational training, gaining experience in different clinical departments and in different hospital settings such as in rural hospitals. Most doctors then enter a four to six year vocational training toward becoming independent practitioners accredited by specialty colleges. For most specialties (other than general practice), this vocational training takes place largely in public hospital settings. (sub. 32, p. 8)

Australia's public hospital system includes 69 public teaching hospitals (excluding psychiatric hospitals). The majority of public teaching hospitals are located in Queensland and New South Wales, which have 22 and 20 respectively (AIHW 2009a).

The teaching role of hospitals has implications for their costs and resource allocation, as noted by study participants:

> The cost structures in the large teaching hospitals in particular reflect the teaching and research components of the work that is done. Both these activities are inseparable from the provision of care. A doctor can be treating his patients, teaching his registrars and gathering material for research all at the same time, using all the same facilities and drawing on the same support staff and services … It is universally understood and accepted that surgery will take longer if doctors in training are being taught during it. (Australian Medical Association, sub. 28, p. 1)

This point was also made by Access Economics, in their submission prepared for Medibank Private, Australian Unity, Bupa Australia and Ramsay Health Care:

> Many public hospitals have a research and teaching role, which adds costs to the public sector …. Significant numbers of staff specialists in a teaching hospital devote a substantial proportion of their time to teaching, research, clinical management and service to specialist societies and professional colleges. These costs are … not distinguished from the general budget of public hospitals. However, research and teaching do provide additional benefits to a hospital by granting access to students, collaborative research facilities, and personnel to undertake some tasks (at a small internalised cost) (sub. DR60, p. 12)

Although clinical training is increasingly being undertaken in the private hospital sector, the public hospital sector retains primary responsibility for this role (DOHA, sub. 32; Queensland Health, sub. 27; SA Department of Health, sub. 4). State and territory governments continue to direct the majority of funding for clinical training to public hospitals, although some states fund clinical training places in other healthcare settings.

2.4 Workforce characteristics

Nurses represent the largest share (45 per cent) of the public hospital sector workforce nationally (table 2.9). Diagnostic and allied health professionals, and administrative and clerical staff, each represent approximately 15 per cent of the workforce, medical officers represent 11 per cent, and domestic and other staff constitute the remaining 13 per cent.

Table 2.9 **Number of staff in public hospitals, by occupation, 2007-08**[a]

	Salaried medical officers	*Nurses*	*Diagnostic and allied health professionals*	*Domestic and other staff*	*Administrative and clerical staff*	*Other personal care staff*[b]
NSW	8 353	36 726	12 470	9 627	11 099	na
Vic	6 783	27 024	12 412	6 578	10 802	..
Qld	5 622	19 219	4 860	7 462	6 177	923
SA	2 190	9 152	2 043	1 848	3 071	787
WA	2 667	9 593	2 906	4 194	4 053	na
Tas	512	2 222	527	995	660	..
NT	342	1 212	321	558	432	15
ACT	526	1 945	474	173	614	181
Australia	**26 996**	**107 089**	**36 013**	**31 434**	**36 909**	na

[a] Number of full-time equivalent staff in acute and psychiatric hospitals. Data exclude one hospital in Victoria, two hospitals in Tasmania, and pathology staff in Queensland. [b] For New South Wales and Victoria, *Other personal care staff* are classified as *Diagnostic and allied health professions* or *Domestic and other staff*. **..** Not applicable. **na** Not available.

Source: AIHW (2009a).

Some variations from the national averages are apparent. For example, medical officers constitute a relatively larger share of the public hospital workforce in the ACT, and a relatively smaller share in New South Wales, Victoria and Tasmania. Nurses constitute a relatively larger share of the public hospital workforce in New South Wales, South Australia and the ACT, and a relatively small share in Victoria, Western Australia and the Northern Territory. Victoria is characterised by a relatively high share of diagnostic and allied health professionals.

Some notable differentials in the average salaries of public hospital staff are also evident between the states and territories. Although the average annual salaries of nursing staff are generally similar among the states and territories, the Northern Territory stands out for offering almost $15 000 more than the national average (table 2.10). The average salaries of medical officers show relatively more variation. Comparatively high annual salaries are offered to medical officers in the Northern Territory and Western Australia (up to $27 000 more than the national average), while medical officers receive the lowest annual average salaries in New South Wales, South Australia and the ACT.[6]

Table 2.10 **Average salaries of staff in public hospitals, 2007-08[a]**

	Salaried medical officers	*Nurses*	*Diagnostic and allied health professionals*	*Domestic and other staff*	*Administrative and clerical staff*	*Other personal care staff*[b]
NSW	137 766	73 702	64 367	51 188	59 834	na
Vic	152 284	75 503	53 505	62 953	44 809	na
Qld	159 069	72 044	67 317	46 252	51 662	50 635
SA	141 196	72 152	72 019	35 312	52 568	41 722
WA	178 762	77 422	71 333	53 021	56 719	na
Tas	158 685	71 293	64 432	41 612	49 529	na
NT	181 065	89 656	76 490	53 233	58 693	67 279
ACT	142 171	76 261	74 449	45 284	58 995	49 758
Australia	**151 211**	**74 237**	**62 259**	**51 491**	**52 910**	**47 020**

a Average salaries (in dollars) of full-time equivalent staff in acute and psychiatric hospitals. **b** For New South Wales and Victoria, *Other personal care staff* are classified as *Diagnostic and allied health professions* or *Domestic and other staff*. **na** Not available.

Source: AIHW (2009a).

2.5 Recent developments in public hospitals

From 2003-04 to 2007-08:

- The number of beds available in acute public hospitals increased, but only matched population growth. The system has maintained a ratio of around 2.6 beds per 1000 residents.
- The number of separations has increased by around 13 per cent, equivalent to 10 more separations per 1000 residents. The relative shares of same-day and overnight separations have stayed roughly constant.
- An increase in the annual number of separations per capita, alongside the fact that the number of beds per capita has remained stable, suggests that the average length of a separation per bed has shortened. This is supported by data showing that the average length of stay and the relative stay index have fallen slightly over these four years.

---

6 Salary comparisons in the other staff categories are not computed due to differences in data reporting.

- The waiting time for elective surgery has lengthened, although proportionally fewer patients are waiting more than one year.
- The number of occasions of service delivered to non-admitted patients has increased by 4.7 million, equivalent to more than 10 per cent over this four-year period (table 2.11).

Table 2.11 **Changes in acute public hospitals, 2003-04 to 2007-08[a]**

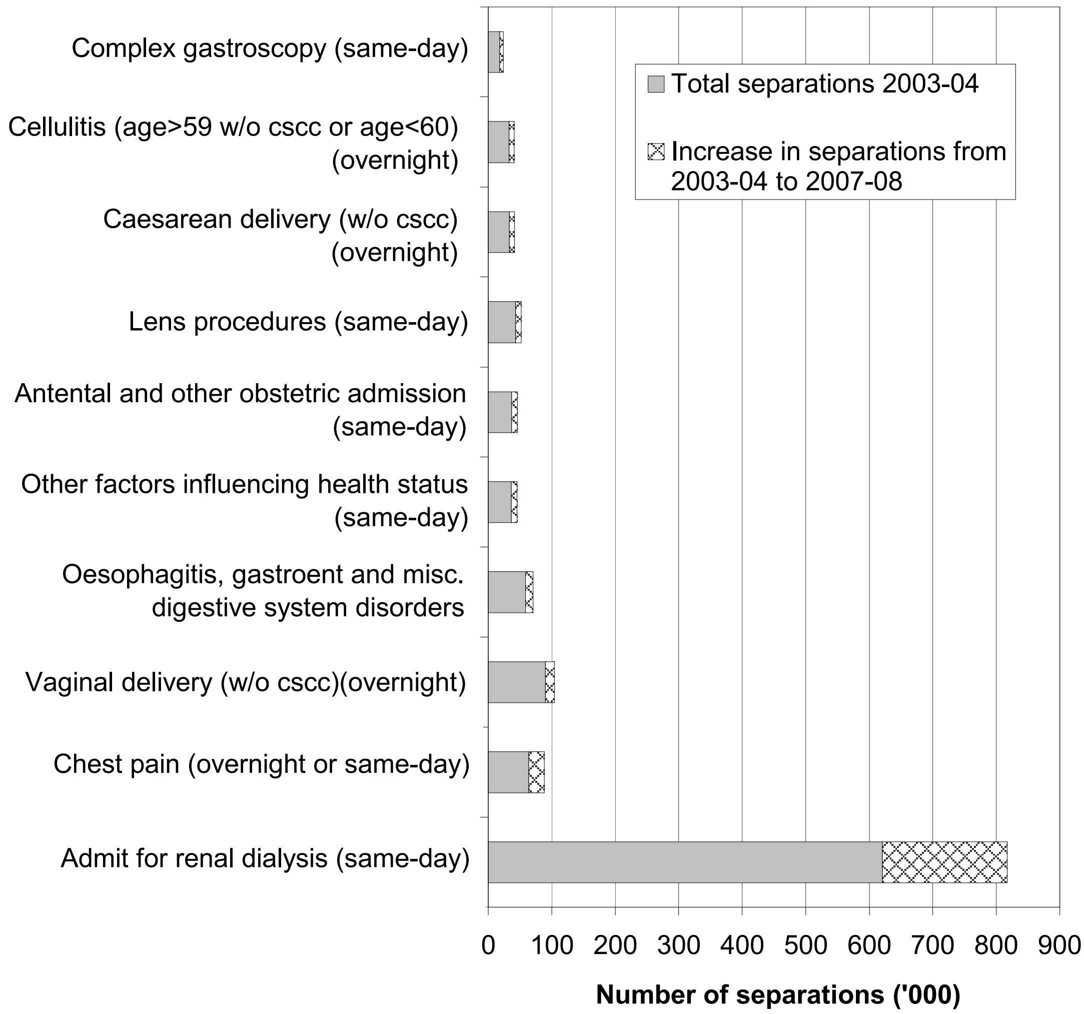
	2003-04	*2004-05*	*2005-06*	*2006-07*	*2007-08*
Number of hospitals	741	739	736	739	742
Number of beds available	51 038	52 806	52 236	53 563	53 137
Number of beds available per 1000 residents	2.55	2.61	2.54	2.57	2.55
Number of separations (‘000)	4 183	4 261	4 451	4 646	4 729
Number of separations per 1000 residents	206.9	207.3	212.8	218.0	216.9
Per cent of same-day separations	49.1	49.2	49.7	50.2	49.9
Average length of stay for overnight separations (days)	6.4	6.4	6.3	6.2	6.2
Relative stay index[b]	1.02	0.99	0.99	0.98	0.98
Waiting times for elective surgery[c]					
Days waited at 50th percentile	28	29	32	32	34
Days waited at 90th percentile	193	217	237	226	235
Per cent patients waiting more than 365 days	3.9	4.8	4.9	3.1	3.0
Number of non-admitted occasions of service (‘000)	43 660	42 759	44 750	46 141	48 355

[a] Data refer to acute hospitals only, whereas data reported in previous tables refer to acute and psychiatric hospitals. [b] Directly standardised relative stay index. A value greater than 1 indicates that an average patient’s length of stay is greater than expected for their type of separation, while a value less than 1 indicates that the length of stay is shorter than expected. [c] Data for reporting hospitals only, and include some private hospitals that are contracted to provide elective surgery to public patients.

Source: AIHW (2009a).

Growth in public hospital activity over this four-year period is mainly attributed to growth in medical cases, rather than surgical or other types of treatment (AIHW 2009a). Same-day admissions for renal dialysis (classified as medical) is the fastest growing type of separation in Australia’s public hospital sector, increasing by over 30 per cent in the four-year period up to 2007-08 (figure 2.8). The next fastest growing types of separations in public hospitals are admissions for chest pain, childbirth and other obstetrics, and digestive disorders. The ten most rapidly growing types of separations in the public hospital sector were all among the ten most frequent types of overnight or same-day separations in public hospitals in 2007-08 (as illustrated earlier in figures 2.6 and 2.7).

Figure 2.8 **Ten fastest increasing public hospital separations by AR-DRG, 2003-04 to 2007-08[a]**



[a] Acute and psychiatric hospitals. Data for 2003-04 are defined according to AR-DRG version 5.0. Data for 2007-08 are defined according to AR-DRG version 5.1 (see box 2.2). Data classifications are subject to minor revision between years. w/o: without. cc: complications and comorbidities. cs: catastrophic or severe. misc.: miscellaneous.

Source: AIHW (2009a).

Emergency department services are one of the fastest growing type of services provided by public hospitals (AIHW 2009a). In the four-year period up to 2007-08, emergency department presentations in public hospitals grew by almost 30 per cent (table 2.12). Despite the higher volume of activity, the proportion of presentations treated in the clinically appropriate time and median waiting times have remained stable (although care needs to be exercised when interpreting waiting-time data for emergency departments, as there appears to be significant variation between hospitals in how waiting times are measured and in the assignment of clinical urgency categories).

Table 2.12 **Public hospital emergency department activity, 2003-04 to 2007-08[a]**

	2003-04	*2004-05*	*2005-06*	*2006-07*	*2007-08*
Number of emergency department presentations ('000)	4 308	4 529	4 915	5 287	5 537
Per cent of presentations seen on time[b]					
Resuscitation	99	100	99	99	100
Emergency	76	76	77	78	76
Urgent	63	64	64	65	63
Semi-urgent	65	65	65	66	66
Non-urgent	87	88	87	88	87
Median waiting time (minutes)					
Resuscitation	–	–	–	–	–
Emergency	5	5	5	5	6
Urgent	22	21	21	20	21
Semi-urgent	38	37	37	36	36
Non-urgent	28	28	29	28	28

[a] Data for reporting hospitals only. Not all hospitals include an emergency department. [b] Time period is specified according to the triage category. – Nil.

Source: AIHW (2009a).

The future governance, funding arrangements and delivery of services in the public hospital sector are set for reform under COAG's NHA and National Partnership Agreement on Hospital and Health Workforce Reform (COAG 2008b, 2008d, 2008e). The anticipated impact of these reforms, alongside the suite of recommendations recently proposed by the National Health and Hospital Reform Commission (NHHRC 2009), are further considered with the future direction of the private hospital sector in chapter 4.

3 Australia's private hospital sector

Key points

- Private hospitals differ greatly in size, function and management. Of the 556 private hospitals in Australia, there are large organisations operating many hospitals, as well as smaller bodies running single or only a few facilities. A substantial number of private hospitals are run as not-for-profit entities while others are operated on a for-profit basis.
- Around 80 per cent of patients in private hospitals are privately insured, and the majority of private hospital funding is received from private health insurers for treating their members. Indeed, patient revenue (including from self-funded patients) accounted for around 96 per cent of private acute and psychiatric hospital income in 2006-07.
- Private hospitals treated 40 per cent of all hospital inpatients and performed 64 per cent of elective surgeries in Australia in 2007-08. About 17 per cent of separations from private hospitals in 2007-08 were for chemotherapy, renal dialysis and same-day colonoscopies. Fewer than 10 per cent of private acute and psychiatric hospitals had emergency departments in 2006-07.
- Rights of private practice for medical specialists are an important feature of workforce arrangements in private hospitals, and there is evidence suggesting that medical specialists are generally able to earn higher incomes in private hospitals than in public hospitals. There is little publicly available data about the wages and conditions of nursing staff in the private hospital sector.
- Private hospitals have recently experienced significant increases in the number of separations and some changes to the composition of services provided. There also appears to be some increase in the extent of clinical teaching by private hospitals.

Private hospitals are privately owned and operated institutions, catering for patients who are treated by a doctor of their own choice.[1] Patients are charged fees for accommodation and other services provided by private hospitals and relevant medical and paramedical practitioners (AIHW 2009a). Private hospitals exist in response to patients' willingness-to-pay for a choice of doctor, private ward

[1] Some hospitals which deliver public hospital services are privately owned. Such hospitals are classified as public as they operate on behalf of, and are funded by, a government.

facilities and relatively faster access to hospital services. The Australian Private Hospitals Association (APHA, sub. 25, p. 2) commented that the private hospital sector exists in 'explicit recognition that individuals should be able to exercise choice in health care'.

Recent data show that there are 556 private hospitals in Australia, of which 285 are acute or psychiatric hospitals and 271 are freestanding day hospitals (DOHA 2009c). Acute hospitals provide at least some medical, surgical or obstetric care for admitted patients and provide round-the-clock comprehensive qualified nursing services, as well as other necessary professional services. Freestanding day hospital facilities provide investigation and treatment for acute conditions on a day-only basis (ABS 2008e).

This chapter profiles the structure and activity of Australia's private hospitals, including the types of services delivered, the characteristics of the patients treated, and the workforce. Recent developments in the public hospital sector are also examined. While focus is placed on the activity of acute and psychiatric hospitals, private freestanding day hospitals are separately profiled, given their role in the wider private hospital system.

3.1 Structure of private hospitals

Ownership and management

Of the 289 private acute and psychiatric hospitals in Australia in 2006-07, 165 were run on a for-profit basis and 124 were not-for-profit (table 3.1). Not-for-profit hospitals are those which qualify as a non-profit organisation with either the Australian Taxation Office or the Australian Securities and Investments Commission. These are further categorised as 'religious or charitable' and 'other' (ABS 2008e).

Both for-profit and not-for-profit entities are among the largest providers of private hospital services in Australia. The for-profit companies Ramsay Health Care and Healthscope are among the ten largest enterprises — by market capitalisation — in the Australian Securities Exchange's listed healthcare sector (ASX 2009). Ramsay Health Care operates over 65 hospitals and day surgery units across Australia, while Healthscope owns or manages 44 medical and surgical, rehabilitation and psychiatric hospitals (Ramsay Health Care Limited 2009a; Healthscope Limited, sub. 42). In the not-for-profit sector, Catholic services represent the largest grouping of health, community and aged care services in Australia, providing 9500 beds in 75 (private and public) healthcare facilities including seven teaching hospitals (CHA 2009b). In relation to the services provided by Catholic hospitals, Catholic Health Australia (CHA) noted that:

> Catholic hospitals also have a mission focus which is often reflected in providing a wider range of treatments, such as palliative care, than might be the case than if the hospital was purely focused on profit maximisation. It also means that some Catholic hospitals are located in geographic regions which might not necessarily be attractive to for-profit operators. (sub. 20, p. 2)

Table 3.1 **Number of private acute and psychiatric hospitals, 2006-07**

	For-profit	*Not-for-profit*		*All*
		Religious or charitable	*Other*[a]	
New South Wales	np	18	np	85
Victoria	50	18	14	82
Queensland	27	24	6	57
South Australia	6	7	17	30
Western Australia	np	10	np	23
Tas, NT and ACT[b]	np	6	np	12
Australia	**165**	**83**	**41**	**289**

[a] Comprises bush nursing, community and memorial hospitals. [b] Data for Tasmania, the Northern Territory and the ACT are aggregated to protect the confidentiality of the small number of hospitals in each of these jurisdictions. **np** Not published but included in totals where applicable, unless otherwise indicated.

Source: ABS (*Private Hospitals*, Cat. no. 4390.0).

Funding arrangements

Private hospitals source their revenue largely from use of their operating theatres and bed facilities, and a number provide a broad range of services such as diagnostics, chemotherapy and sub-acute care that also generate revenue from patients. Private hospitals generally order and pay for prostheses and then recoup the cost from health insurance funds and, in some instances, patients. Medical fees are usually billed separately and direct to the patient from the medical provider, as opposed to being directed via hospital accounts.

Private hospitals operate under fee-for-service funding models that reward additional activity. Therefore, private hospitals generally have an incentive to maximise throughput. Private hospitals, particularly the for-profit sector, seek to maximise returns on their capital investment and labour force, for the benefit of owners/shareholders. While the revenue-generation motive is likely to be less strong for not-for-profit private hospitals, these hospitals also aim to avoid making losses.

Across most private hospital structures, patient revenue is the dominant source of hospital income. In 2006-07, this ranged from 95 per cent of hospital income for religious or charitable private acute and psychiatric hospitals to 98 per cent for for-profit providers (table 3.2). DOHA advised that:

> Revenue for private hospitals and day hospital facilities can come from a number of sources (e.g. Department of Veterans' Affairs, state/territory health authorities' contracts, self-funding by patients and compensable patients), but the majority of funding is received from private health insurers for treating their members. It is therefore in the interest of facilities to negotiate comprehensive contracts with individual insurers. (sub. 32, p. 6)

Table 3.2 **Income and expenditure of private hospitals, 2006-07**

	For-profit	*Not-for-profit*	
		Religious or charitable	*Other*[b]
	$'000	$'000	$'000
Income			
Patient revenue[c]	3 543 450	3 012 142	254 890
Recoveries[d]	53 238	74 009	6 650
Other[e]	39 336	92 335	6 427
Total income	3 636 025	3 178 486	267 967
Recurrent expenditure[f]			
Wages and salaries including on-costs	1 700 724	1 556 302	144 770
Drug, medical and surgical supplies[g]	873 026	810 497	68 778
Food supplies	45 478	47 084	4 951
Other domestic services	45 630	49 801	4 179
Administrative expenses	208 042	239 737	17 022
Repairs and maintenance	46 237	39 177	3 537
Other[h]	297 164	353 347	26 230
Total recurrent expenditure	3 216 301	3 095 945	269 464
Gross capital expenditure[i]	207 984	220 453	11 282

[a] Acute and psychiatric hospitals (excludes freestanding day hospitals). [b] Comprises bush nursing, community and memorial hospitals. [c] Includes revenue received by, and due to, the hospital in respect of patient liability for accommodation and other fees. [d] Recoveries includes income received from items such as staff meals and accommodation, and facility fees paid by medical practitioners. [e] Includes investment income, income from charities, bequests and visitors' expenses. [f] Expenditure on goods and services which does not result in the creation or acquisition of fixed assets. [g] Includes surgically implanted prostheses and homograft items. [h] Includes interest, depreciation, contract services and transport. [i] Expenditure on the acquisition or enhancement of assets (excluding financial assets).

Source: ABS (*Private Hospitals*, Cat. no. 4390.0).

Wages and salaries, and drug, medical and surgical supplies are the biggest recurrent expenditure items for private acute and psychiatric hospitals. Together these represented 78 per cent of total recurrent expenditure in 2006-07 (ABS 2008e). Wages and salaries (including on-costs) constituted around or just above 50 per cent of total recurrent expenditure for both for-profit and not-for-profit private hospitals (ABS 2008e). These expenditure figures do not include the costs of non-salaried medical staff (such as independent practitioners).

Capital expenditure varies year-to-year in the private health sector due to the irregular nature of such expenditure. Significant purchases or construction undertaken in a given year are unlikely to be repeated for some time (ABS 2008e).

Service costs

The cost structures for services in the private hospital sector are very different than those in the public sector. The SA Department of Health commented that:

> Medical services in private hospitals are provided on a fee-for-service basis rather than by the hospital. One result is that it is in the doctors' best interests to ensure as many theatre cases as possible are done in each set of booked theatre time. (sub. 4, p. 4)

Medical costs for the private sector are difficult to ascertain, as doctors usually bill patients directly. Private hospitals are not made aware of, and so do not record, these costs (APHA, sub. DR65). The Australian Health Service Alliance noted that:

> Doctor costs in the private sector are in general a matter between the patient and the doctors involved in the care. This applies to doctors involved in such care whether they are the primary treating physician or surgeon, or other medical practitioners involved in care such as anaesthetists, pathologists and radiologists … Prostheses costs have a different basis in the public and private sector. In the public sector they are included in hospital funding. In the private sector they are in effect negotiated separately at the industry level and the hospital is simply the conduit by which prostheses are supplied to patients by their treating doctor. (sub. 1, pp. 4–5)

Tax regimes differ between for-profit and not-for-profit hospitals. Fringe benefits of up to $17 000 per employee are exempt from fringe-benefits tax for not-for-profit hospitals (and public hospitals). Not-for-profit private hospitals (and public hospitals) are also exempt from payroll tax. The tax arrangements for private and public hospitals are discussed further in chapter 5 and appendix D.

The average cost per patient day tends to increase as hospital size increases, which the ABS noted 'is a reflection of the greater complexity of procedures undertaken at the larger hospitals' (ABS 2008e, p. 18).[2] More complex procedures necessitate greater use of highly trained staff, expensive equipment, drugs and medical supplies. It is also noted that religious and charitable hospitals have relatively higher

---

2 Patient days are the aggregate number of days of stay for all overnight-stay patients who were separated from hospital during the year. Same-day patients are each counted as having a stay of one day (ABS 2008e).

average costs per patient day than for-profit and other not-for-profit hospitals. (ABS 2008e). The fact that religious and charitable hospitals constitute over half of the largest sized private acute and psychiatric hospitals (more than 200 beds) — while comprising less than 30 per cent of all private acute and psychiatric hospitals — may help to explain the higher average costs of larger-sized hospitals.

Licensing

State and territory health authorities are responsible for licensing private hospitals and private day hospitals, and mandate a range of operational and quality requirements. Licensing requires these facilities to meet a range of criteria, such as building regulations, provision of speciality services, as well as safety and quality. Licensing requirements vary from one jurisdiction to another and, in some jurisdictions, differ for private hospitals and day hospital facilities.

New South Wales currently has separate regulations for private hospitals and private day hospitals. The regulations for private hospitals are somewhat more prescriptive around furnishings, staffing and quality assurance processes than for private day hospitals. New South Wales' proposed Private Health Facilities Regulation 2009 will remove the distinction between private hospitals and private day hospitals and impose compliance burdens based on services offered, rather than facility type, size or location.

In Victoria, private hospitals and private day hospitals are subject to the same regulatory requirements (Health Services (Private Hospitals and Day Procedure Centres) Regulations 2002). These regulations contain minimum nursing staff-to-patient ratios and the mix of nursing staff. These staffing requirements are more specific than for other jurisdictions.

Among the jurisdictions, South Australia, Tasmania and the Northern Territory do not have specific licensing criteria for day hospital facilities but inspect new facilities and provide assurances that the facilities are suitable for Australian Government declaration as private hospitals. The Australian Department of Health and Ageing (DOHA) noted that the Commonwealth Minister for Health and Ageing has the power to declare private hospitals for health insurance purposes, Medicare benefits and the Pharmaceutical Benefits Scheme (DOHA, sub. 32).

3.2 Characteristics of private hospitals

Private hospitals exhibit great diversity in the choice of where, how and what services they offer, and may specialise in particular procedures or types of patients. For example, some private hospitals are women's or children's hospitals, or have units or departments specialising in women's and/or children's health. Examples include the Mater Children's Private Hospital and the Mater Mothers' Private Hospital (Queensland), Woodvale Private Hospital for Women (Western Australia), and the Allowah Presbyterian Children's Hospital (New South Wales).

Number and activity of private hospitals

The majority of private acute and psychiatric hospitals are located in New South Wales and Victoria (table 3.3). New South Wales had a lower number of private acute and psychiatric hospital patient separations per 1000 residents than the national average in 2007-08, while Queensland's number was comparatively higher. On average, 57 per cent of separations in private acute and psychiatric hospitals were same-day admissions.

Table 3.3 **Number and activity of private hospitals, 2007-08[a]**

	Number of hospitals	*Number of separations*	*Number of separations per 1000 residents*	*Proportion same-day separations*[b]
New South Wales	84	662 743	90.8	59.7
Victoria	75	663 465	114.9	55.6
Queensland	55	596 730	138.8	56.9
South Australia	31	196 865	112.0	53.1
Western Australia	24	259 807	120.5	55.9
Tas, NT and ACT[c]	11	np	np	np
Australia	**280**	**2 461 852**	**115.1**	**56.8**

[a] Acute and psychiatric hospitals (excludes freestanding day hospitals).

Source: AIHW (2009a).

Size of private hospitals

A significant proportion of private acute and psychiatric hospitals are relatively small: 43 per cent have fewer than 50 beds, while less than 10 per cent have more than 200 beds (table 3.4).

Table 3.4 **Number of private hospitals by size, 2006-07[a]**

	0–50 beds[b]	*51–100 beds*	*101–200 beds*	*Over 200 beds*	*Total*
New South Wales	35	32	15	3	85
Victoria	37	24	16	5	82
Queensland	22	16	12	7	57
South Australia	8	7	np	np	30
Western Australia	10	3	6	4	23
Tas, NT and ACT[c]	3	5	np	np	12
Australia	**125**	**87**	**55**	**22**	**289**

a Acute and psychiatric hospitals (excludes freestanding day hospitals). Data refers to different time period to previous table due to differences in data availability. **b** Number refers to hospitals with 26 to 50 beds for South Australia, Tasmania, the Northern Territory and the ACT. The number of hospitals with fewer than 26 beds is not published for these states and territories. **c** Data for Tasmania, the Northern Territory and the ACT are aggregated to protect the confidentiality of the small number of hospitals in each of these jurisdictions **np** Not published but included in totals where applicable.

Source: ABS (*Private Hospitals*, Cat. no. 4390.0).

In terms of the number of beds, acute and psychiatric hospitals operated by religious and charitable institutions were generally larger than other private hospitals. They accounted for around 20 per cent of the smallest private hospitals (up to 50 beds), but for 40 per cent of hospitals with 101 to 200 beds, and around 60 per cent of those with more than 200 beds (ABS 2008e).

Location of private hospitals

About 75 per cent of all available private acute and psychiatric hospital beds in 2006-07 were located in capital cities, even though only 64 per cent of Australia's population lived in these areas (ABS 2008e). There are more private acute and psychiatric hospitals in metropolitan than regional areas nationally (table 3.5). The one exception at a state level is Queensland, which has 63 per cent of its private acute and psychiatric hospitals, and 50 per cent of its private acute and psychiatric hospital beds, outside of Brisbane. For other jurisdictions (where data are available), at least 70 per cent of all beds are located within capital cities. There are relatively fewer private hospital beds outside of capital cities than there are private hospitals, suggesting that private hospitals outside of capital cities are, on average, smaller than their capital city counterparts.

Acute and psychiatric hospitals operated by religious and charitable institutions provided 10 246 beds during 2006-07, equivalent to 42 per cent of the total number of available beds in all private acute and psychiatric hospitals. Around 75 per cent of these beds were located in capital cities while the remaining share were outside capital cities (ABS 2008e).

Table 3.5 **Number of private hospitals and beds by location, 2006-07[a]**

	Number of hospitals[b]			*Number of beds*		
	Capital city	*Rest of state/territory*	*Total*	*Capital city*	*Rest of state/territory*	*Total*
New South Wales	57	28	85	4 573	1 823	6 396
Victoria	61	21	82	5 605	1 005	6 610
Queensland	21	36	57	2 863	2 824	5 687
South Australia	21	9	30	1 748	130	1 878
Western Australia	17	6	23	np	np	2 795
Tas, NT and ACT[c]	8	4	12	np	np	1 061
Australia	**185**	**104**	**289**	**18 095**	**6 332**	**24 427**

[a] Acute and psychiatric hospitals (excludes freestanding day hospitals). [b] These data relate to a different reporting period (July 2006 to June 2007) than the DOHA figures cited earlier (September 2009). [c] Data for Tasmania, the Northern Territory and the ACT are aggregated to protect the confidentiality of the small number of hospitals in each of these jurisdictions. **np** Not published but included in totals where applicable.

Source: ABS (*Private Hospitals*, Cat. no. 4390.0).

Patients in private hospitals

In 2007-08, private hospitals administered 3.1 million separations, of which nearly 2.5 million took place in acute and psychiatric hospitals. Female patients accounted for around 55 per cent of all private hospital separations, while patients aged 35 to 64 accounted for around 45 per cent of all private hospital separations. Of note is the lower incidence of private hospital separations for females aged 65 and over in Western Australia (table 3.6).

Table 3.6 **Share of private hospital separations by patient profile, 2007-08[a]**

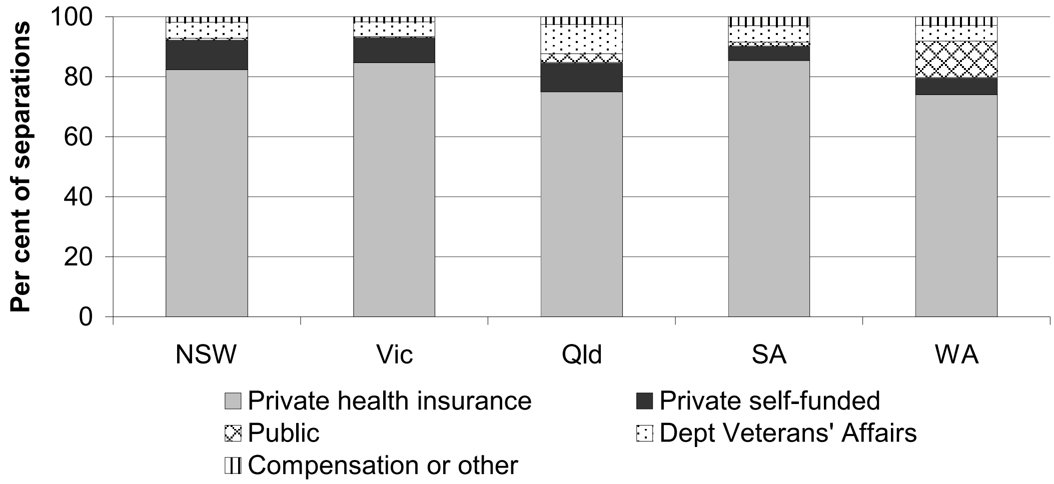
	Males				*Females*			
	0–14	*15–34*	*35–64*	*65 & over*	*0–14*	*15–34*	*35–64*	*65 & over*
New South Wales	2.3	4.6	19.5	18.4	1.7	9.7	25.1	18.5
Victoria	1.7	4.4	18.7	18.7	1.3	10.5	26.6	18.1
Queensland	1.9	3.9	20.1	20.2	1.4	9.7	24.4	18.4
South Australia	2.0	4.5	19.3	20.5	1.4	7.8	24.9	19.5
Western Australia	2.6	5.4	21.4	17.0	1.9	11.1	26.5	13.9
Tas, NT and ACT[b]	2.3	5.1	19.9	16.8	1.7	11.5	26.6	15.7
Australia	**2.1**	**4.5**	**19.7**	**18.9**	**1.5**	**10.0**	**25.5**	**17.9**

[a] All private hospitals. Per cent of total separations in each state or territory, according to patient's sex and age group. Each row sums to 100 per cent. [b] Data for Tasmania, the Northern Territory and the ACT are aggregated to protect the confidentiality of the small number of hospitals in each of these jurisdictions.

Source: AIHW (2009a).

The majority of patients in private hospitals are funded by private health insurance or self-funded. Nationally, the proportion of private hospital separations covered by private hospital insurance was 80 per cent in 2007-08 (figure 3.1). For Queensland, a larger proportion of private hospital patients are self-funded or funded by the Department of Veterans' Affairs than is the case for other jurisdictions.

Figure 3.1 **Share of private hospital separations by patient funding source, 2007-08[a]**

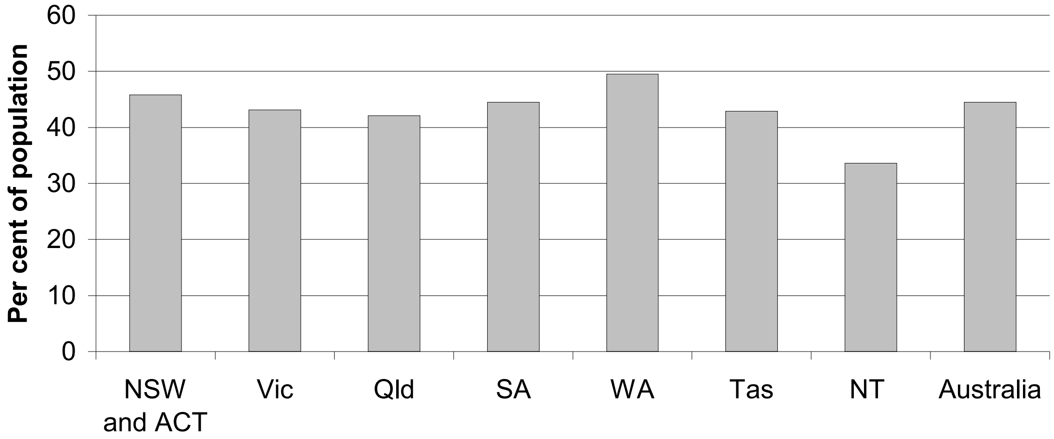


a The share of self-funded patients may be underestimated as some are unable to be identified. Data exclude patients whose funding source is not reported. Compensation or other includes workers compensation, other compensation, motor vehicle third party personal claim, other public authorities, and other funding sources. Data for Tasmania, the Northern Territory and the ACT are not published.

Source: AIHW (2009a).

These rates of private hospital usage do not appear to be fully explained by private health insurance participation rates of the states and territories (figure 3.2). Among the jurisdictions, Western Australia and the grouping of New South Wales and the ACT have the highest rates of private health insurance, while the Northern Territory and Queensland have the lowest.

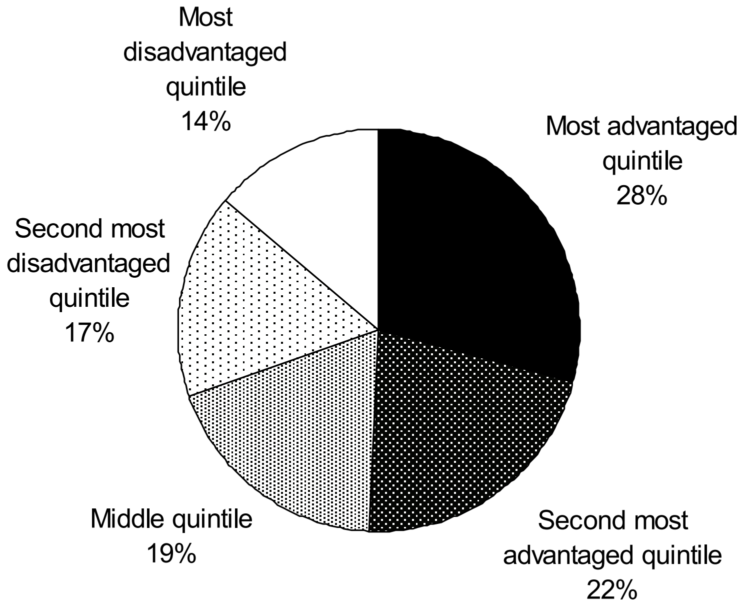
Figure 3.2 **Share of population with private health insurance, 2008**



Source: PHIAC (2009c).

The share of private hospital separations according to patients' socioeconomic status is presented in figure 3.3. In 2007-08, nearly 30 per cent of patients in private hospitals were from areas of the highest quintile of socioeconomic advantage. The top two quintiles of socioeconomic advantage accounted for around 50 per cent of all private hospital separations. Comparatively, 14 per cent of patients in private hospitals were from the lowest quintile.

Figure 3.3 **Share of private hospital separations by socioeconomic status of patients, 2007-08[a]**



[a] Quintile of socioeconomic status based on ABS (2008f) Index of Relative Socioeconomic Advantage/Disadvantage score based on the patient's area of usual residence.

Source: AIHW (2009a).

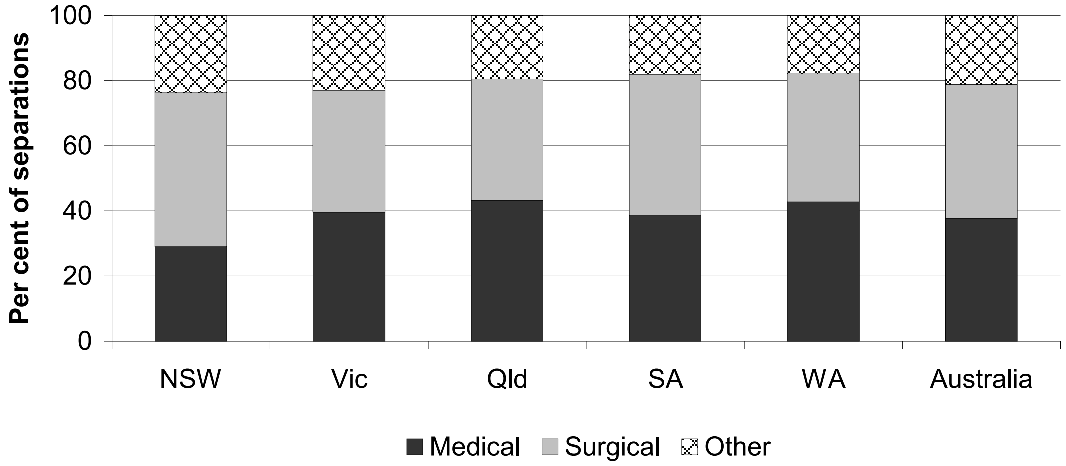
3.3 Services provided by private hospitals

Private hospitals often specialise in a limited range of surgical procedures, although there are also a number of full-service private hospitals that offer a comparable range of services to those provided by the large public teaching hospitals. Private hospitals tend to provide more elective procedures than public hospitals, accounting for approximately 64 per cent of all elective surgery separations in Australia in 2007-08 (AIHW 2009a).

Patient services

Nationally, 41 per cent of separations from private hospitals were classified as surgical in 2007-08. A further 38 per cent of private hospital separations were classified as medical (figure 3.4).

Figure 3.4 **Share of private hospital separations by AR-DRG partition, 2007-08[a]**

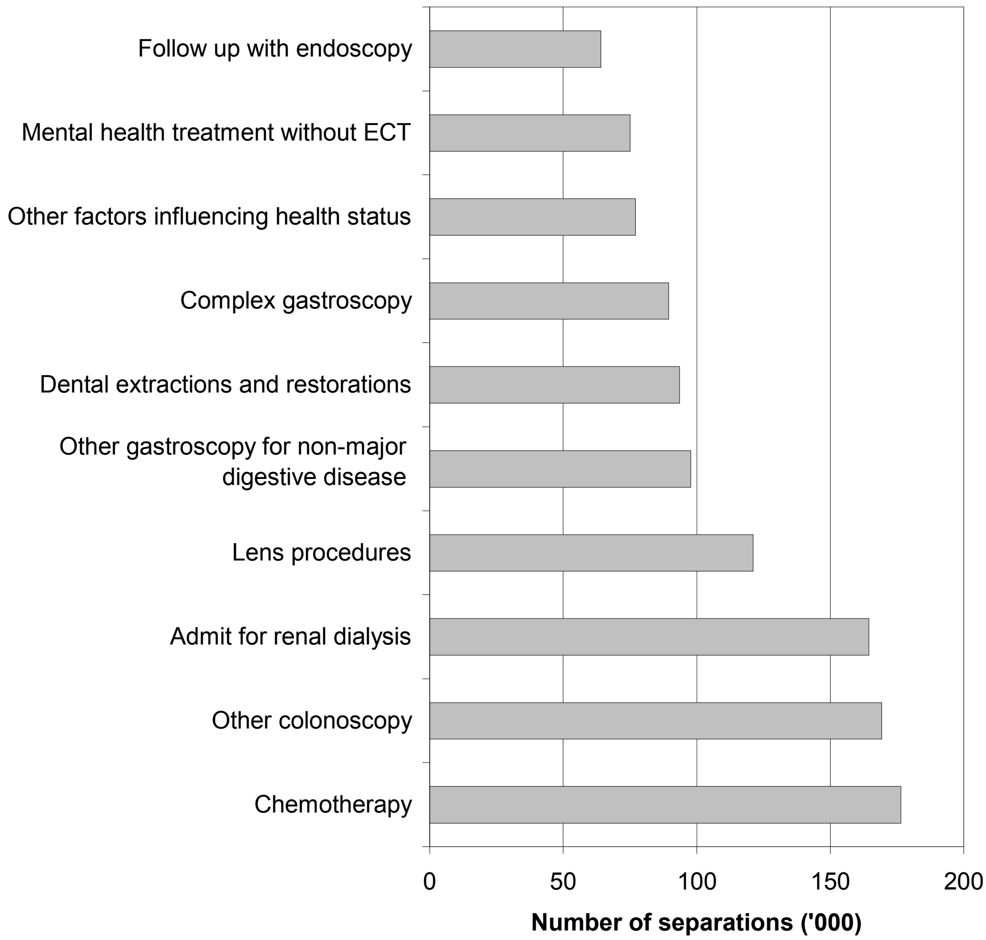


[a] As defined in AR-DRG version 5.1 (see box 2.2). Data for Tasmania, the Northern Territory and the ACT are not published, but are included in totals.

Source: AIHW (2009a).

The most frequent private hospital same-day and overnight separations in 2007-08 are listed in figures 3.5 and 3.6. The ten most frequent same-day separations made up around 37 per cent of all private hospital separations.

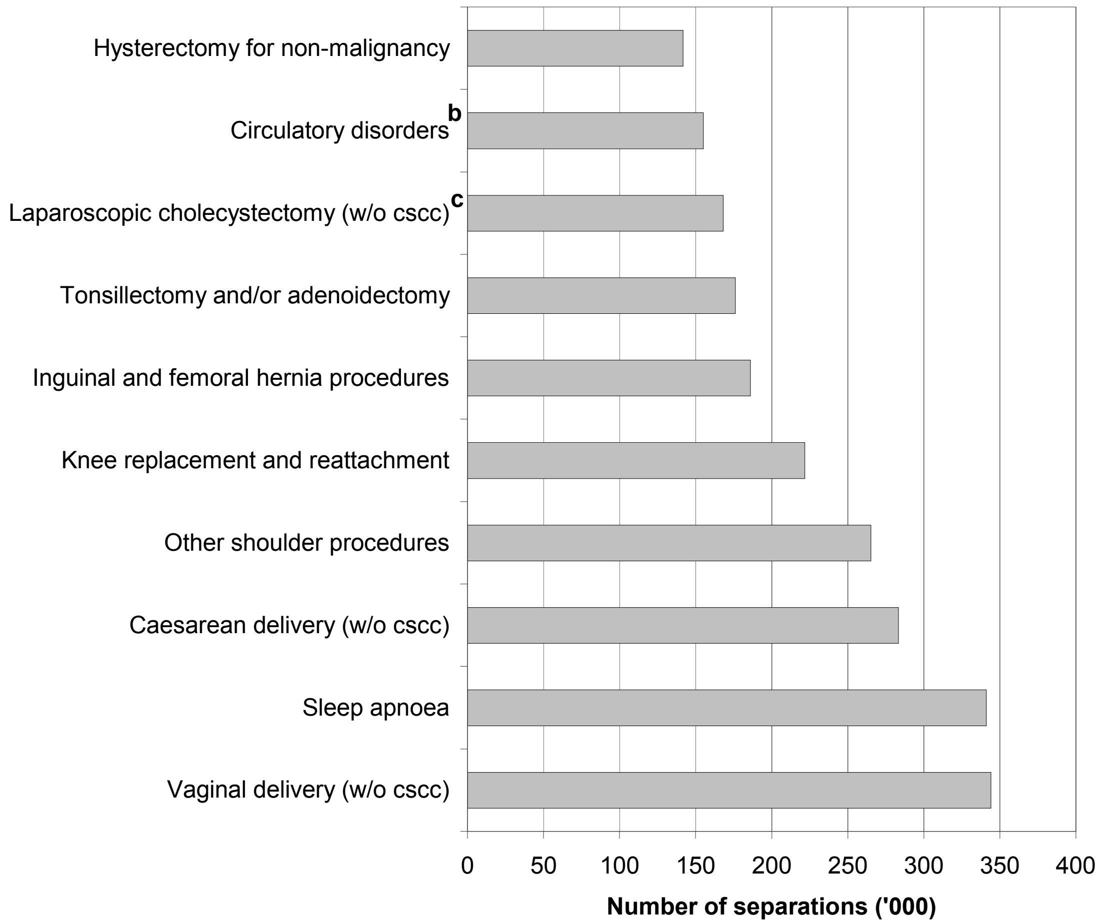
Figure 3.5 **Most frequent same-day private hospital separations by AR-DRG, 2007-08[a]**



a Acute and psychiatric hospitals (excludes freestanding day hospitals). Ten most frequent same-day separations, as defined in AR-DRG version 5.1 (box 2.2). ECT: electroconvulsive therapy.

Source: AIHW (2009a).

Figure 3.6 **Most frequent overnight private hospital separations by AR-DRG, 2007-08**[a]



[a] Acute and psychiatric hospitals (excludes freestanding day hospitals). Ten most frequent overnight separations, as defined in AR-DRG version 5.1 (box 2.2). [b] Without acute myocardial infarction; with invasive cardiac investigation procedure; without complex diagnosis or procedure. [c] Without common bile duct exploration. w/o: without. cc: complications and comorbidities. cs: catastrophic or severe.

Source: AIHW (2009a).

The type of care offered by private hospitals differed across jurisdictions (table 3.7). There are a comparatively high number of private geriatric separations in Victoria, a low number of private newborn separations in South Australia, a high number of private maintenance care separations in Queensland, and a high number of private rehabilitation separations in New South Wales.

Table 3.7 **Number of private hospital separations by care type, 2007-08[a]**

	Acute care	Rehabilitation	Newborn	Geriatric[b]	Palliative care	Maintenance care[c]
New South Wales	783 374	68 039	22 917	..	441	105
Victoria	777 176	13 717	4 057[d]	6 778	511	63
Queensland	748 685	25 036	18 716	66	2 433	1 208
South Australia	235 971	6 511	920	35	199	10
Western Australia	319 665	1 159	10 177	64	2 098	258
Tas, NT and ACT[e]	118 464	1 197	4 640	1	84	55
Australia	**2 983 335**	**115 659**	**61 427**	**6 944**	**5 766**	**1 699**

[a] Acute, psychiatric and freestanding day hospitals. Excludes other and not reported care types. [b] Includes geriatric evaluation and management, and psychogeriatric care. [c] Maintenance care refers to the provision of accommodation and nursing care as a service itself. This can include respite care, care to patients awaiting placement, and care to inpatients designated as nursing home type, but excludes residential aged care. [d] The reporting of newborns with unqualified days only is not compulsory for the Victorian private sector, resulting in a low number of separations in this category. [e] Data for Tasmania, the Northern Territory and the ACT are aggregated to protect the confidentiality of the small number of hospitals in each of these jurisdictions. **..** Not applicable.

Source: AIHW (2009a).

Research and training

Research and training are important and growing activities of private hospitals. Historically, these services have been more typically provided by the public sector. However, 47 private hospitals provided teaching to medical staff and undergraduates in 2006-07 (ABS 2008e).

The interim results of a recent CHA clinical placements survey suggest that midwifery, nursing and medical placements are the most common clinical placements in CHA facilities (both public and private) (CHA 2009a).[3] In its submission to this study, CHA (sub. 20) noted the significant clinical teaching and research that is undertaken by Catholic private hospitals. For-profit private hospital operators also offer clinical training opportunities for health care students. For example, Ramsay Health Care provided over 2 million clinical placement hours to undergraduate nursing and medical students in 2007-08 (Ramsay Health Care Limited 2009c). Further, APHA advised that:

> Australia's private hospitals invest $35 000 000 a year in the education and training of surgeons, doctors, nurses and other healthcare professionals. (sub. 25, p. 5)

3 The CHA clinical placements survey reported 40 responses received from CHA facilities, and includes aged care facilities as well as public and private hospitals (CHA 2009a).

There are a number of government programs facilitating greater training in private hospitals. For example, under the Expanded Specialist Training Program, medical registrars on training programs undertake rotations through a range of settings, including: private hospitals; specialists' rooms; clinics; day surgeries; and Aboriginal medical services (DOHA 2009g). The private hospital sector's increasing role in training is discussed further in section 3.6.

Emergency care in private hospitals

Comparatively few private hospitals provide emergency department services. APHA noted that:

> Some of the large acute medical/surgical private hospitals provide similar services to their public sector counterparts, including accident and emergency services. However, this applies largely in the densely-populated metropolitan areas. (sub. 25, p. 3)

In 2006-07, 24 private hospitals had emergency departments and 47 private hospitals treated accident and emergency cases. Among the states, Victoria had the largest number of private hospitals with accident and emergency services (15), followed by Queensland (13) (table 3.8).

Table 3.8 **Accident and emergency treatment in private hospitals, 2006-07[a]**

	Number of hospitals treating accident and emergency cases	*Number of hospitals with an emergency department*	*Number of accident and emergency patients treated*
New South Wales	5	4	54 829
Victoria	15	4	106 095
Queensland	13	9	162 758
South Australia	8	np	35 345
Western Australia	np	3	np
Tas, NT and ACT[b]	np	np	np
Australia	**47**	**24**	**453 572**

a Acute and psychiatric hospitals (excludes freestanding day hospitals). **b** Data for Tasmania, the Northern Territory and the ACT are aggregated to protect the confidentiality of the small number of hospitals in each of these jurisdictions. **np** Not published but included in totals where applicable.

Source: ABS (*Private Hospitals*, Cat. no. 4390.0).

Without an emergency department, private hospitals arguably have more predictable workflows and uninterrupted throughput of patients. However, the NSW Health Surgical Services Taskforce (sub. DR43) observed that disruptions to elective surgical services can be minimised through effective management of emergency surgical admissions.

The Australasian College for Emergency Medicine noted that some private hospitals have established emergency departments for a number of reasons:

> a. Emergency departments are the safest and most efficient way to provide acute, unscheduled care whether in public or private hospitals.
>
> b. As private hospitals began to expand their range and complexity of services, a mechanism was needed to provide acute care whether to new patients or to patients post-discharge.
>
> c. Private hospitals needed to respond to the expectation from insured patients that they should be able to choose private hospital care in the event of an emergency and not have to attend a public hospital. Some private hospitals, in particular the church and charitable organisations, felt they had an obligation to their communities to provide an alternative to public hospital emergency departments, albeit at a cost to the patient.
>
> d. An emergency department gave the hospital a source of patients that was independent of their attending specialists. It also attracted patients at times and on days when elective admissions were less frequent such as weekends thereby increasing the productivity of hospital facilities.
>
> e. In general, health insurance rates were declining during the 1990s. Therefore, ensuring 24-hour availability and expanding services beyond elective or scheduled care gave private hospitals with an emergency department a competitive edge.
>
> f. Patients who were admitted via an emergency department represent a casemix and complexity that helps attract new specialists to a private hospital.
>
> g. For some private hospitals, an emergency department was the only way they could fund a medical staff presence on the campus 24 hours a day. (sub. 14, p. 2)

3.4 Workforce characteristics

There were 46 718 salaried staff in private acute and psychiatric hospitals in 2006-07 (table 3.9), although this figure does not include medical practitioners with rights of private practice. In these hospitals, nursing staff accounted for 60 per cent of total salaried staff, and there were an average of 1.4 nurses per occupied bed. Salaried medical officers and other diagnostic professionals accounted for close to 7 per cent of total salaried staff in these hospitals, and administrative and clerical staff accounted for 16 per cent (ABS 2008e). Within the category of administrative and clerical staff are occupations including: accounting; engineering; information technology; and communications. The number of hospital managers and their roles are difficult to discern from the data, as hospital managers may or may not also be clinicians (Centre for Health Economics, Monash University, sub. 7).

Table 3.9 **Number of staff in private hospitals, 2006-07[a]**

	NSW	*Vic*	*Qld*	*SA*	*WA*	*Tas, NT and ACT*[b]	*Australia*
All salaried staff	12 066	12 152	10 882	3 672	6 093	1 854	46 718
Salaried medical officers and other diagnostic health professionals	881	988	589	129	419	100	3 106
Nursing	7 244	7 247	6 454	2 244	3 398	1 214	27 801
Administrative and clerical	1 815	1 885	2 099	589	959	297	7 645
Domestic and other	2 126	2 031	1 740	710	1 317	242	8 166
Staff per bed[c]	2.5	2.4	2.3	2.4	2.7	2.3	2.4
Nursing staff	1.5	1.4	1.4	1.5	1.5	1.5	1.4
Other[d]	1.0	1.0	0.9	0.9	1.2	0.8	1.0

[a] Full-time equivalent staff in acute and psychiatric hospitals (excludes freestanding day hospitals). [b] Tasmania, the Northern Territory and the ACT are aggregated to protect the confidentiality of the small number of hospitals in these states/territories. [c] Average number of staff per occupied bed. [d] Includes salaried medical officers and other diagnostic health professionals, administrative, domestic and other staff.

Source: ABS (*Private Hospitals*, Cat. no. 4390.0).

In the case of nursing staff, agreements at the enterprise or jurisdiction level between employers and employee unions are common means of setting wages. Available data suggest that pay rates for nurses in the private hospital sector are close to those in the public hospital sector (NSW Nurses' Association 2009). In Victoria, by 31 January 2010, the most experienced Grade 2 registered nurse will be paid $1201.40 per week in public and Healthscope hospitals and $1207.83 per week at the Epworth hospitals (Workplace Authority 2008a, 2008b; Department of Health Victoria 2009). In occupations such as nursing, employment conditions (for example, the length of breaks between shifts) are also a key focus in collective agreement negotiations.

Rights of private practice

In the hospital system, many medical specialists have rights of private practice as well as having an established relationship with one or more private and/or public hospitals. As CHA noted:

> Many private hospitals are co-located with a public hospital. Many doctors work in both sectors — as a salaried or sessional medical officer in the public sector and as an independent practitioner in the private sector. Many doctors view their work time spent across both types of hospitals as complementary and contributing to their overall work and remuneration package. Remuneration rates are lower in the public system compared with the private sector and many doctors who work in the private sector see it as part of their professional duties to work for part of a week in a public hospital — including undertaking teaching responsibilities. (sub. 20, p. 7)

Furthermore, CHA noted that it is not only doctors who move across both sectors — nurses, allied health professionals and medical students are among those who may also have this mobility.

In the private sector, medical specialists are in non-salaried positions and work independently of the hospital. Indicative requirements for such positions include: fellowship from an Australian specialty college or recognised equivalent; eligibility to be registered as a specialist with the relevant Australian medical board; and appropriate indemnity insurance (Healthscope Limited 2009b; Ramsay Health Care Limited 2009b).

Consultation with a number of study participants has suggested that there are no data collections to indicate the number of specialists who have the right to admit patients to private hospitals, the specific nature of these arrangements, or whether there are specialties for which such arrangements are more common. One possible reason may be that granting admission rights to medical practitioners is a decision for individual hospitals.

3.5 Private freestanding day hospitals

Private freestanding day hospitals make up around half of all private hospitals. The number of private freestanding day hospitals has been increasing over time, since many procedures which used to require overnight hospital stay can now be performed on a day-only basis due to advances in technology and treatment methods.

Private freestanding day hospitals are fundamentally different to private acute and psychiatric hospitals and public hospitals, making comparison with these entities difficult. Private freestanding day hospitals often focus on a small number of procedures at the exclusion of many other activities undertaken by larger acute hospitals. This is a key reason why these facilities have been excluded from the later comparative analysis. While not part of this study’s direct comparison of public and private hospitals, these facilities are important for understanding the hospital sector overall and the sector’s development over time.

Most private freestanding day hospitals are in metropolitan areas, and there are more in New South Wales than in any other state or territory (table 3.10). Private freestanding day hospital facilities accounted for almost 670 000 or around 20 per cent of total private sector separations in 2007-08 (AIHW 2009a). New South Wales has a lower ratio of separations to beds than Queensland and Victoria.

This may, in part, reflect differences in the activities undertaken by private freestanding day hospitals among the jurisdictions (table 3.10).

Table 3.10 **Private freestanding day hospital facilities, 2007-08**

	Number of facilities	*Number of beds*	*Number of separations*	*Separations per 1000 residents*
New South Wales	88	722	195 177	27
Victoria	73	558	168 826	31
Queensland	51	340	183 569	43
South Australia	24	130	46 732	26
Western Australia	28	352	65 611	30
Tasmania	2	9	np	np
Northern Territory	–	–	np	np
ACT	6	40	np	np
Australia	**272**	**2 151**	**668 033**	**32**

np Not published but included in totals where applicable. – Nil.

Source: AIHW (2009a).

The output of private freestanding day hospitals is mainly surgical. Of the 30 AR-DRGs with the largest number of separations from private freestanding day hospitals in 2007-08, 16 were classified as surgical, seven were medical and seven were classified as ‘other’ (AIHW 2009a). In 2006-07, specialist endoscopy, ophthalmic, plastic/cosmetic and general surgery facilities accounted for around 65 per cent of private freestanding day hospitals (table 3.11). In 2006-07, New South Wales accounted for 53 per cent of general surgery day facilities and around 44 per cent of ophthalmic day facilities in Australia.

Table 3.11 **Number of private freestanding day hospital facilities by type of centre, 2006-07**

	General surgery	*Specialist endoscopy*	*Ophthalmic*	*Plastic/ cosmetic*	*Other*[a]	*Total*[b]
NSW	8	21	25	7	29	90
Vic	np	31	9	np	23	73
Qld	4	15	14	3	16	52
SA	..	4	3	9	8	24
WA	..	np	np	..	12	17
Tas, NT and ACT[c]	np	np	np	np	4	12
Australia	**15**	**76**	**57**	**28**	**92**	**268**

[a] Includes fertility and sleep disorders clinics. [b] These data (2006-2007) are for a different reporting period than the AIHW data in table 3.10 (2007-08). The total number of hospitals changed between reporting periods. [c] Data for Tasmania, the Northern Territory and the ACT are aggregated to protect the confidentiality of the small number of hospitals in each of these jurisdictions. **np** Not published but included in totals where applicable. **..** Not applicable.

Source: ABS (*Private Hospitals*, Cat. no. 4390.0).

Nursing staff accounted for around 58 per cent of total staff in private freestanding day hospitals in 2006-07 (table 3.12). This is a similar proportion to nursing staff in private acute and psychiatric hospitals. Administrative and clerical staff accounted for about 32 per cent of staffing in private freestanding day hospitals, which is around double the proportion of these staff in private acute and psychiatric hospitals. This may reflect an increased administrative burden from higher patient turnover in these facilities.

Table 3.12 **Number of staff in private freestanding day hospitals, 2006-07**

	General surgery	*Specialist endoscopy*	*Ophthalmic*	*Plastic/ cosmetic*	*Other*[a]	*Total*[b]
Nursing staff	122	344	330	101	477	1 373
Administrative and clerical	33	240	173	52	263	761
Other[c]	14	51	74	8	105	251
Total staff	169	634	577	160	845	2 385

[a] Including fertility and sleep disorders clinics. [b] Full-time equivalent staff. [c] Includes salaried medical officers and other diagnostic health professionals, administrative, domestic and other staff.

Source: ABS (*Private Hospitals*, Cat. no. 4390.0).

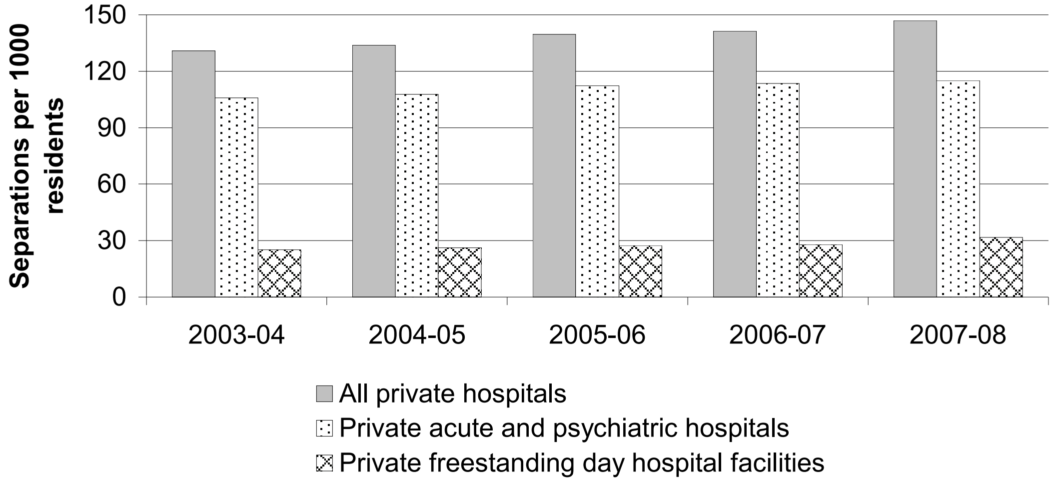
3.6 Recent developments in private hospitals

Increasing numbers of patient separations

Total private hospital separations per 1000 residents have increased by more than 12 per cent since 2003-04. Within this, separations from private acute and psychiatric hospitals have risen by close to 9 per cent over the same period (figure 3.7). This highlights the rapid growth of private freestanding day hospitals (close to 27 per cent over the period), albeit from a lower base. There was also an increase in the average number of beds in private acute and psychiatric hospitals in the capital cities by 410 beds, and a decrease in the average number of beds in regional Australia by 96 beds, between 2005-06 and 2006-07 (ABS 2008e).

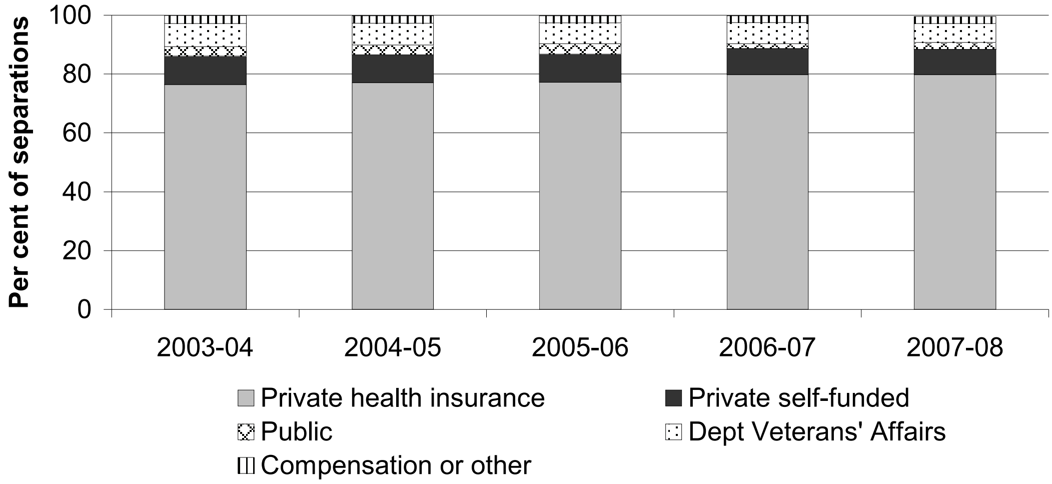
The proportion of private hospital separations funded by private hospital insurance increased slightly between 2003-04 and 2007-08, from around 76 per cent to 80 per cent (figure 3.8). The proportions of private hospital patient separations accounted for by public, Department of Veterans' Affairs and self-funded patients each declined by around 1 per cent over the period.

Figure 3.7 **Private hospital separations per 1000 residents, 2003-04 to 2007-08**



Source: AIHW (2009a).

Figure 3.8 **Private hospital patient separations by funding source, 2003-04 to 2007-08[a]**



[a] Data exclude patients whose funding source is not reported.

Source: AIHW (2009a).

Changing private hospital services

The most common AR-DRGs among private hospital patients have changed little in recent years. Of the 30 most common private hospital AR-DRGs in 2007-08, 28 were among the 30 most common in 2003-04.[4] However, there have been significant increases in the number of private hospital separations for the most common AR-DRGs. Table 3.13 sets out recent changes in the number of separations for the 15 most common private hospital AR-DRGs in 2007-08. All but two reported an increased number of separations between 2003-04 and 2007-08.

Table 3.13 **Number of separations for the most common private hospital AR-DRGs, 2003-04 to 2007-08[a]**

AR-DRG	*Description*	*2007-08*	*Change from 2003-04*
R63Z	Chemotherapy	176 372	32 228
G44C	Other colonoscopy, same-day	169 234	29 529
L61Z	Admit for renal dialysis	164 480	30 862
C16B	Lens procedures, same-day	121 181	23 934
G45B	Other gastroscopy for non-major digestive disease, same-day	97 758	- 5 061
D40Z	Dental extractions and restorations	93 575	14 826
G46C	Complex gastroscopy, same-day	89 533	28 689
Z64B	Other factors influencing health status, same-day	77 046	34 772
U60Z	Mental health treatment, same-day, without electroconvulsive therapy	75 018	9 624
Z40Z	Follow up with endoscopy	64 058	8 901
I18Z	Other knee procedures	64 026	8 477
J11Z	Other skin, subcutaneous tissue and breast procedures	53 625	3 280
O05Z	Abortion with operating room procedure	51 114	4 305
N07Z	Other uterine and adnexa procedures for non-malignancy	49 167	11 483
O60B	Vaginal delivery without catastrophic or severe complications or comorbidities	34 498	- 675

a Data for 2003-04 are defined according to AR-DRG version 5.0. Data for 2007-08 are defined according to AR-DRG version 5.1 (see box 2.2). Data classifications are subject to minor revision between years.

Source: AIHW (2009a).

Some study participants noted recent changes in the breadth and composition of private hospital services. CHA observed:

> The private hospital sector is providing an increasing proportion of total hospital services in many different specialty groups, particularly in the areas of cardiac medical, cardiac interventional, oncology, obstetrics, orthopaedics and gastroenterology. (sub. 20, p. 2)

APHA (sub. 25) commented that a number of complex procedures and treatments traditionally associated with public hospitals are now performed more often in

4 The following AR-DRGs were not among the 30 most common private hospital separations in 2003-04: retinal procedures and other female reproductive system operating room procedures (patients aged under 65) without malignancy, complications or comorbidities.

private hospitals, including knee replacements, procedures of the digestive system, prostatectomies, chemotherapy and major malignant breast conditions. It is also noteworthy that private hospital separations increased between 2003-04 and 2007-08 across 22 of the 23 Major Diagnostic Categories, with the exception of a small decrease of 62 separations in the burns category (AIHW 2009a).

Increasing teaching role

It appears that private hospitals are increasingly involved in teaching, although data to support this development is limited. The number of private hospitals teaching medical staff, nursing staff and allied health professionals increased between 2005-06 and 2006-07 (table 3.14).

Table 3.14 **Private hospitals with teaching roles, 2005-06 to 2006-07[a]**

	2005-06	*2006-07*	*Percentage change*
Number of private hospitals teaching:			
Medical staff/undergraduates	42	47	12
Nursing staff/undergraduates	163	171	5
Allied health professionals	58	61	5
Number of hospitals with affiliated teaching status	67	64	-5
Nursing staff providing nurse education	272	319	17

a Acute and psychiatric hospitals (excludes freestanding day hospitals). Measured in full-time equivalent staff.

Source: ABS (*Private Hospitals*, Cat. no. 4390.0).

On the private sector's take-up of teaching responsibilities, Australasian College for Emergency Medicine noted that:

> Whilst most private emergency departments would embrace and welcome involvement in medicine training, it must be recognised that if students are placed without adequate resourcing and process re-engineering, it is likely that the performance (both financial and throughput) of private emergency departments will deteriorate. (sub. 14, p. 5)

4 Public and private hospitals in the health system

Key points

- Public and private hospitals are similar in a number of ways. A comparison of the types of diagnoses most frequently treated by public and private hospitals indicates that the two sectors offer many of the same hospital services, particularly chemotherapy, renal dialysis and medical obstetrics. More broadly, a number of large metropolitan private hospitals offer a range of services on par with large public hospitals including, in some instances, accident and emergency treatment and clinical training.
- Differences between public and private hospitals in terms of hospital size, location and services are, in part, a function of their business models, government requirements and community expectations.
  - The public hospital sector handles the majority of acute care separations and accounts for most regional and remote hospitals, while private hospitals are more concentrated in metropolitan areas and are more likely to treat patients of higher socioeconomic advantage.
  - The public sector's activity is concentrated on medical cases (including those typically admitted through emergency departments) while the private sector's activity is more concentrated on surgical (typically elective) procedures.
- The overall relationship between the two sectors is not clear cut, especially as the sectors do not operate in isolation, as exemplified by co-located hospitals sharing resources and medical staff working across both sectors. Although differences between and within the sectors make valid comparison difficult, Australia's robust and well-established system of public and private hospitals — and the overlap in their services — enables a comparison of their respective performance to be considered.
- The respective roles, responsibilities and accountabilities of public and private hospitals may change with the new National Healthcare Agreement and the future response of governments to the recommendations of the National Health and Hospitals Reform Commission.

Australia's hospitals are an integral part of the nation's health system, providing an extensive range of services — including acute, emergency, newborn, geriatric, diagnostic, rehabilitation, palliative and outpatient care — designed to fulfil the health needs of all residents across the nation. As part of Australia's comprehensive system of health services, hospitals contribute to the nation's health outcomes in combination with other key components, including health-promotion strategies, disease-prevention strategies, chronic disease management, other primary care services and accessible aged care. The performances of each of these components are interdependent, such that deficiencies in one part of the health system are likely to place greater demand on another. Shortfalls in the provision of primary care and aged care in some more remote areas of Australia, for example, necessitate that hospitals deliver these essential services to these communities. Hospitals must therefore be evaluated in the context of their roles and responsibilities.

It is clearly recognised that public and private hospitals are driven by different operational motives, typically treat different types of patients, and typically deliver different suites of services. As such, these differences need to be taken into account if comparisons between the public and private hospital sectors are to be valid and useful. Given the broad scope of differences between public and private hospitals, one role of this study is to highlight the complexities and limitations of conducting a comparative assessment. At the same time, this study aims to identify the factors by which the two sectors can be appropriately compared, allowing for the possibility that discernible differences in the services offered by the two sectors may be partly indicative of their respective fields of specialty and relative efficiency.

This chapter looks at the role of public and private hospitals as part of Australia's overall health system. The similarities and differences between the two sectors, and their degree of complementarity and competitiveness, are examined. The possible future directions of public and private hospitals in Australia, including the wider pressures facing the hospital system, are discussed.

4.1 Similarities and differences

The different operational motives of the public and private hospital sectors contribute to differences in the size and location of public and private hospital establishments, as well as in the services they offer and patients they treat. This section elaborates on some key differences between the public and private sectors in the context of the hospital system as a whole, while also recognising their similarities.

Core differences in the operational incentives, roles and responsibilities of the public and private hospital sectors highlight the complexity of directly comparing the sectors on the basis of efficiency. Indeed, study participants have confirmed that efficiency may not be the primary objective of all hospital providers, and that some explicit objectives of the public sector — the delivery of emergency care, equity of access, and clinical research and training — also contribute to the overall quality of the health system:

> [H]ospital performance may not be the greatest priority in the objectives of certain groups. State administrators have different priorities to hospital managers (who may or may not also be clinicians). There are also equity considerations, and many other issues such as the capacity which must be held back when running an emergency department, as well as staff commitments to teaching and medical research — all critical components to a high quality healthcare system, and again reducing comparability of providers. (Centre for Health Economics, Monash University, sub. 7, p. 2)

Given the complexities involved in assessing the comparative performance of the two hospital sectors, this study acknowledges that points of similarity will help identify the factors by which the sectors can be appropriately compared. For example, large private hospitals that treat a similar casemix to the public sector, conduct teaching and research and run emergency departments are likely to be sufficiently similar to many public hospital establishments to merit an evaluative comparison. On the other hand, points of difference between the sectors should not necessarily preclude a comparative assessment, but serve to highlight the factors that must be taken into account in the assessment, and may potentially signal areas of relative efficiency.

Similarities and differences in hospital establishments

The majority of very small hospitals (with 50 or fewer beds) and very large hospitals (more than 200 beds) are public. Moderately sized hospitals (between 51 and 200 beds) are more evenly distributed across the two sectors (table 4.1).

Table 4.1 **Share of public and private hospitals by size[a]**

	Public hospitals[b]	*Private hospitals*[c]	*Australia*
	%	%	%
0–50 beds	81	19	100
51–100 beds	46	54	100
101–200 beds	54	46	100
201 beds or more	78	22	100
All hospitals	73	27	100

[a] Acute and psychiatric hospitals. [b] Data for public hospitals are for 2007-08. [c] Data for private hospitals are for 2006-07.

Source: ABS (*Private Hospitals*, Cat. no. 4390.0); AIHW (2009a).

Public and private hospitals operate in broadly similar numbers in metropolitan areas. Given public hospitals' service obligations in rural and regional areas, as well as the private hospital sector's commercial considerations, all hospitals in remote and very remote areas of Australia are provided by the public sector (table 4.2).

Table 4.2 **Public and private hospitals by location, 2009[a]**

	Public hospitals	*Private hospitals*	*Australia*
	%	%	%
Major cities	45	55	100
Inner regional	76	24	100
Outer regional	93	7	100
Remote	100	—	100
Very remote	100	—	100

[a] Acute and psychiatric hospitals. Remoteness area based on ABS (2005) Australian Standard Geographical Classification. — Nil.

Source: DOHA (2009c, 2009e).

The need for the public hospital sector to ensure service delivery in rural and regional areas, while also undertaking teaching in the large metropolitan areas, helps to explain the diversity of hospital establishments in the public hospital sector. On the other hand, the different operational objectives of the private hospital sector help to explain why few establishments are small enough to be adversely affected by a lack of economies of scale, and none are located in remote areas where distance and isolation contribute to higher resource costs.

Similarities and differences in services

Patient services

In 2007-08, public hospitals accounted for around 61 per cent of total hospital separations, while private acute and psychiatric hospitals accounted for around 31 per cent. The remainder were separations in private freestanding day hospitals. Public hospitals provided the majority of all types of hospital care with the exception of rehabilitation services, and also accounted for the majority of medical cases handled by Australia's hospital system. In contrast, private hospitals accounted for the majority of surgical and other procedures, performing around two-thirds of all elective surgery (table 4.3). New South Wales Health (sub. 40) commented that private hospitals may be, in effect, more selective in their admissions than public hospitals, because they are less likely to be equipped to treat long-stay or highly complex medical cases. These types of cases are likely to be redirected to the public hospital sector instead. However, the Australian Private Hospitals Association (APHA) (sub. 25) commented that a number of complex procedures and treatments traditionally associated with public hospitals are now commonly performed in private hospitals.

Table 4.3 **Share of hospital separations by sector, 2007-08**

	Public hospitals	*Private hospitals*	*Australia*
	%	%	%
Separations by type of care			
Acute care	60	40	100
Rehabilitation	39	61	100
Palliative care	79	21	100
Geriatric	74	26	100
Maintenance care	92	8	100
Newborn	79	21	100
Separations by type of diagnosis			
Surgical	43	57	100
Medical	75	25	100
Other	31	69	100
Elective procedures	36	64	100

[a] Defined by AR-DRG partition (box 2.2).

Source: AIHW (2009a).

Outside of admitted patient services, public hospitals handled over 90 per cent of the total number of accident and emergency presentations reported in 2007-08 (AIHW 2009a).

A detailed comparison of the types of services provided by the two hospital sectors is presented in the following lists of the 30 most frequent overnight and same-day separations that were treated in each sector in 2007-08, categorised according to Australian Refined Diagnosis-Related Groups (AR-DRGs) (box 2.2).

In a comparison of the 30 most frequent overnight AR-DRGs treated in each sector (which represent 33 per cent of overnight separations in the public sector and 42 per cent of overnight separations in the private sector), only eight AR-DRGs were common to both sectors (table 4.4). These common AR-DRGs mainly relate to obstetrics. Of the 22 overnight AR-DRGs that were distinct to the public sector in this sample, many were the type of separation commonly admitted through emergency departments, such as respiratory and cardiac-related cases, injuries, seizures, and treatment for poisoning and the toxic effects of drugs. All but one of these treatments were medical cases, although the one exception — appendicectomy — is a surgery usually performed in emergency circumstances to treat appendicitis. Also distinct to the public sector's most frequent types of separations in this sample was cellulitis — an infection commonly caused by the *Staphylococcus aureus* bacteria (RCPA 2009), which is a condition used in the monitoring of hospital quality. Of the 22 overnight AR-DRGs that were distinct to the private sector in this sample, many were elective procedures such as knee or hip replacements. All but two of these AR-DRGs were surgical cases.

There appears to be considerably more overlap between the sectors in their same-day separations. In a comparison of the 30 most frequent same-day AR-DRGs treated in each sector (which represented 70 per cent of same-day separations in the public sector and 81 per cent of same-day separations in the private sector in 2007-08), 22 AR-DRGs were common to both sectors, including the four most frequent same-day separations overall (table 4.5). Although differing in order of frequency, the top four activities in both sectors were: renal dialysis, chemotherapy, non-complex colonoscopy and lens procedures. The greater degree of overlap in same-day separations between the two sectors may be partly explained by the fact that same-day separations in both hospital sectors appear to be concentrated among a smaller number of AR-DRGs.

Although the public and private hospital sectors displayed more similarity in their same-day separations than in their overnight separations, the concentration of medical cases in the public sector and surgical cases in the private sector was again apparent. Of the eight most frequent treatments distinct to the private sector in this sample, all but two were surgical cases. All eight of the treatments distinct to the public sector in this sample were medical cases.

Table 4.4 Thirty most frequent overnight separations in public and private hospitals by AR-DRG, 2007-08[a]

			Public hospitals			Private hospitals		
AR-DRG	*Partition*[b]	*Description*[c]	*Rank*	*Number of separations*	*Per cent*[d]	*Rank*	*Number of separations*	*Per cent*[e]
O60B	Med	Vaginal delivery (w/o cscc)	1	101 245	4.47	1	34 421	3.39
F74Z	Med	Chest pain	2	52 326	2.31	26	8 427	0.83
G67B	Med	Oesophagitis, gastroent and misc. digestive system disorders (age>9; w/o cscc)	3	42 082	1.86	23	9 212	0.91
O01C	Surg	Caesarean delivery (w/o cscc)	4	41 510	1.83	3	28 324	2.79
J64B	Med	Cellulitis (age>59 (w/o cscc)) or age<60)	5	35 070	1.55		na	
O66A	Med	Antenatal and other obstetric admission	6	33 277	1.47	25	8 504	0.84
O60C	Med	Vaginal delivery (single uncomplicated w/o other condition)	7	24 183	1.07		na	
E65A	Med	Chronic obstructive airways disease (with cscc)	8	22 370	0.99		na	
G66B	Med	Abdominal pain or mesenteric adenitis (w/o cc)	9	22 032	0.97		na	
E65B	Med	Chronic obstructive airways disease (w/o cscc)	10	21 571	0.95		na	
E62C	Med	Respiratory infections/inflammations (w/o cc)	11	21 547	0.95		na	
E69C	Med	Bronchitis and asthma (age<50 w/o cc)	12	21 328	0.94		na	
F62B	Med	Heart failure and shock (w/o catastrophic cc)	13	21 228	0.94		na	
E62B	Med	Respiratory infections/inflammations (with severe or moderate cc)	14	20 407	0.90		na	
U67Z	Med	Personality disorders and acute reactions	15	20 369	0.90		na	
F71B	Med	Non-major arrhythmia and conduction disorders (w/o cscc)	16	20 295	0.90		na	
D63B	Med	Otitis media and upper respiratory tract infection (w/o cc)	17	19 677	0.87		na	
H08B	Surg	Laparoscopic cholecystectomy (w/o common bile duct exploration; w/o cscc)	18	18 558	0.82	8	16 815	1.65
G07B	Surg	Appendicectomy (w/o cscc)	19	18 388	0.81		na	
U63B	Med	Major affective disorders (age<70 w/o cscc)	20	17 111	0.76	12	12 217	1.20
I68B	Med	Non-surgical spinal disorders (w/o cc)	21	16 198	0.71	27	8 088	0.80
U61A	Med	Schizophrenia disorders (with mental health legal status)	22	16 002	0.71		na	
X60C	Med	Injuries (age<65)	23	15 743	0.69		na	
B76B	Med	Seizure (w/o cscc)	24	15 450	0.68		na	
K60B	Med	Diabetes (w/o cscc)	25	14 981	0.66		na	

(Continued next page)

Table 4.4 (continued)

AR-DRG	Partition[b]	Description[c]	Public hospitals Rank	Public hospitals Number of separations	Public hospitals Per cent[d]	Private hospitals Rank	Private hospitals Number of separations	Private hospitals Per cent[e]
L63B	Med	Kidney and urinary tract infections (age>69 or with severe cc)	26	14 831	0.65		na	
X62B	Med	Poisoning or toxic effects of drugs and other substances (age<60 w/o cc)	27	14 672	0.65		na	
L63C	Med	Kidney and urinary tract infections (age<70 w/o cscc)	28	14 364	0.63		na	
O60A	Med	Vaginal delivery (with cscc)	29	14 282	0.63		na	
F73B	Med	Syncope and collapse (w/o cscc)	30	14 040	0.62		na	
E63Z	Med	Sleep apnoea		na		2	34 109	3.36
I16Z	Surg	Other shoulder procedures		na		4	26 536	2.61
I04Z	Surg	Knee replacement and reattachment		na		5	22 184	2.18
G09Z	Surg	Inguinal and femoral hernia procedures (age>0)		na		6	18 605	1.83
D11Z	Surg	Tonsillectomy and/or adenoidectomy		na		7	17 619	1.73
F42B	Other	Circulatory disorders[f]		na		9	15 506	1.53
N04Z	Surg	Hysterectomy for non-malignancy		na		10	14 168	1.39
I03C	Surg	Hip replacement (w/o cscc)		na		11	12 697	1.25
M02B	Surg	Transurethral prostatectomy (w/o cscc)		na		13	11 721	1.15
K04Z	Surg	Major procedures for obesity		na		14	11 718	1.15
I18Z	Surg	Other knee procedures		na		15	11 396	1.12
F15Z	Surg	Percutaneous coronary intervention[g]		na		16	10 183	1.00
I20Z	Surg	Other foot procedures		na		17	10 104	0.99
I10B	Surg	Other back and neck procedures (w/o cscc)		na		18	9 974	0.98
D10Z	Surg	Nasal procedures		na		19	9 929	0.98
N06Z	Surg	Female reproductive system reconstructive procedures		na		20	9 771	0.96
D06Z	Surg	Sinus, mastoid and complex middle ear procedures		na		21	9 574	0.94
J06B	Surg	Major procedures for non-malignant breast conditions		na		22	9 284	0.91
I29Z	Surg	Knee reconstruction or revision		na		24	8 723	0.86

(Continued next page)

Table 4.4 (continued)

AR-DRG	Partition[b]	Description[c]	Public hospitals: Rank	Public hospitals: Number of separations	Public hospitals: Per cent[d]	Private hospitals: Rank	Private hospitals: Number of separations	Private hospitals: Per cent[e]
G11B	Surg	Anal and stomal procedures (w/o cscc)		na		28	7 897	0.78
J06A	Surg	Major procedures for malignant breast conditions		na		29	7 610	0.75
I30Z	Surg	Hand procedures		na		30	7 527	0.74
Total 30 most frequent overnight AR-DRGs				**745 137**	**32.89**		**422 843**	**41.60**

[a] Number of separations ranked according to frequency in each sector, as defined in AR-DRG version 5.1. [b] *Med*: medical partition. *Surg*: surgical partition (see box 2.2). [c] w/o: without. cc: complications and comorbidities. cs: catastrophic or severe. misc: miscellaneous. [d] Per cent of total public hospital overnight separations. [e] Per cent of total private hospital overnight separations. [f] without acute myocardial infarction; with invasive cardiac investigation procedure; without complex diagnosis or procedure. [g] without acute myocardial infarction; with stent implantation. **na**: AR-DRG is not among the 30 most frequent in the sector (data unavailable).

Source: AIHW (2009a).

Table 4.5 **Thirty most frequent same-day separations in public and private hospitals by AR-DRG, 2007-08[a]**

			Public hospitals			Private hospitals		
AR-DRG	*Partition*[b]	*Description*[c]	*Rank*	*Number of separations*	*Per cent*[d]	*Rank*	*Number of separations*	*Per cent*[e]
L61Z	Med	Admit for renal dialysis	1	815 622	34.82	3	164 469	8.29
R63Z	Med	Chemotherapy	2	121 703	5.20	1	176 290	8.89
G44C	Other	Other (non-complex) colonoscopy	3	53 385	2.28	2	169 234	8.53
C16B	Surg	Lens procedures	4	51 907	2.22	4	121 181	6.11
O66B	Med	Antenatal and other obstetric admission	5	45 835	1.96		na	
Z64B	Med	Other factors influencing health status	6	45 378	1.94	8	77 046	3.88
F74Z	Med	Chest pain	7	36 115	1.54		na	
G45B	Other	Other gastroscopy for non-major digestive disease	8	34 160	1.46	5	97 758	4.93
J11Z	Surg	Other skin, subcutaneous tissue and breast procedures	9	33 188	1.42	13	50 106	2.53
Q61C	Med	Red blood cell disorders (w/o cscc)	10	30 008	1.28	24	16 961	0.86
G67B	Med	Oesophagitis, gastroent and misc. digestive system disorders (age>9; w/o cscc)	11	28 628	1.22		na	
Z40Z	Other	Follow up with endoscopy	12	26 873	1.15	10	62 510	3.15
G46C	Other	Complex gastroscopy	13	23 513	1.00	7	89 533	4.51
O05Z	Surg	Abortion (with operating-room procedure)	14	23 431	1.00	12	50 165	2.53
D40Z	Other	Dental extractions and restorations	15	22 983	0.98	6	91 399	4.61
U60Z	Med	Mental health treatment (w/o electroconvulsive therapy)	16	21 734	0.93	9	75 018	3.78
R61C	Med	Lymphoma and non-acute leukaemia	17	21 578	0.92	27	14 061	0.71
L41Z	Other	Cystourethroscopy	18	20 801	0.89	15	26 074	1.31
X60C	Med	Injuries (age<65)	19	20 723	0.88		na	
G66B	Med	Abdominal pain or mesenteric adenitis (w/o cc)	20	18 412	0.79		na	
I68C	Med	Non-surgical spinal disorders	21	17 057	0.73	18	19 575	0.99
N10Z	Surg	Diagnostic curettage or diagnostic hysteroscopy	22	16 288	0.70	22	17 291	0.87
N09Z	Surg	Conisation, vagina, cervix and vulva procedures	23	16 174	0.69	29	12 754	0.64
L67C	Med	Other kidney and urinary tract diagnoses (w/o cscc)	24	15 231	0.65		na	
I30Z	Surg	Hand procedures	25	14 286	0.61	23	17 288	0.87
I18Z	Surg	Other knee procedures	26	14 115	0.60	11	52 630	2.65

(Continued next page)

Table 4.5 (continued)

AR-DRG	*Partition*[b]	*Description*[c]	*Public hospitals*			*Private hospitals*		
			Rank	*Number of separations*	*Per cent*[d]	*Rank*	*Number of separations*	*Per cent*[e]
Q60C	Med	Reticuloendothelial and immunity disorders (w/o malignancy; w/o cscc)	27	13 921	0.59		na	
N07Z	Surg	Other uterine and adnexa procedures for non-malignancy	28	13 787	0.59	14	43 463	2.19
I74C	Med	Injury to forearm, wrist, hand or foot (age<75; w/o cc)	29	13 517	0.58		na	
G11B	Surg	Anal and stomal procedures (w/o cscc)	30	11 873	0.51	20	18 525	0.92
N11B	Surg	Other female reproductive system operating-room procedures (age<65) (w/o cc)[e]		na		16	22 819	1.15
J08B	Surg	Other skin graft and/or debridement procedures (w/o cscc)		na		17	22 770	1.15
C03Z	Surg	Retinal procedures		na		19	19 401	0.98
J10Z	Surg	Skin, subcutaneous tissue and breast plastic operating-room procedure		na		21	18 323	0.92
F42B	Other	Circulatory disorders[f]		na		25	16 862	0.85
B05Z	Surg	Carpal tunnel release		na		26	15 269	0.77
V62B	Med	Alcohol use disorder and dependence		na		28	12 972	0.65
D13Z	Surg	Myringotomy with tube insertion		na		30	12 043	0.61
Total 30 most frequent same-day AR-DRGs				**1 642 226**	**70.11**		**1 603 790**	**80.87**

a Number of separations ranked according to frequency in each sector, as defined in AR-DRG version 5.1. **b** *Med*: medical partition. *Surg*: surgical partition (see box 2.2). **c** w/o: without. cc: complications and comorbidities. cs: catastrophic or severe. misc.: miscellaneous. **d** Per cent of total public hospital same-day separations. **e** Per cent of total private hospital same-day separations. **e** without malignancy. **f** without acute myocardial infarction; with invasive cardiac investigation procedure; without complex diagnosis or procedure. **na** AR-DRG is not among the 30 most frequent in the sector (data unavailable).

Source: AIHW (2009a).

Teaching and training

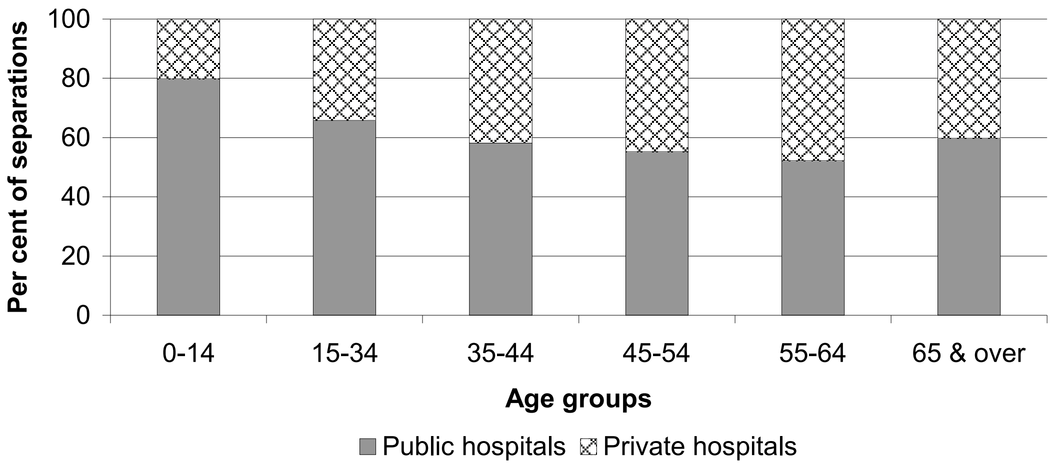
An historical difference between the public and private hospital sectors has been their teaching and training responsibilities. As noted in earlier chapters, the public sector delivers the vast bulk of teaching and training, although private sector involvement is increasing, and recent government programs are facilitating this expansion (DOHA 2009g). Catholic Health Australia (CHA) (sub. 20) noted that many large Catholic hospitals have much in common with large public hospitals through their involvement in teaching and research, and the APHA (sub. 25) noted that the private hospital sector provides a significant volume of training and education to undergraduate medical and nursing students that is not funded by government. It has been argued that greater responsibility for teaching should be assigned to private hospitals, in order to offer more training opportunities in areas of private sector specialisation (Crotty 2005).

Similarities and differences in patients

Patient demographics and socioeconomic status differ between the public and private hospital sectors. Although the public hospital sector handles the majority of separations for patients of all age groups, some variation is apparent (figure 4.1). Children and young people comprise a larger share of the case load of public hospitals, with 28 per cent of patients admitted to public hospitals being under 35 years of age. In private hospitals, the age group with the highest proportion of patients admitted is 50 to 64 years (27 per cent). Patients aged between 75 to 84 years comprise 15 per cent of those admitted to both public and private hospitals, while those aged 85 and over comprise 6 per cent of those admitted to public hospitals and 5 per cent of those admitted to private hospitals.

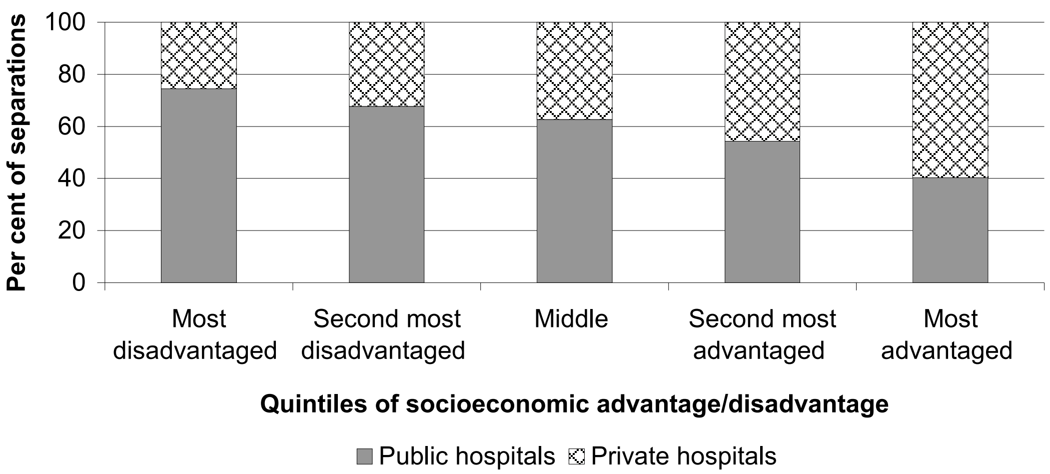
A higher proportion of patients in public hospitals are from disadvantaged socioeconomic areas, compared to patients in private hospitals. Even so, around 26 per cent of patients from the most disadvantaged areas were treated in private hospitals treated in 2007-08 (figure 4.2). Around 40 per cent of patients from the most advantaged socioeconomic areas were treated in public hospitals.

Figure 4.1 **Share of separations by sector and patient age, 2007-08**



Source: AIHW (2009a).

Figure 4.2 **Share of separations by sector and socioeconomic status of patients, 2007-08**[a]



[a] Quintiles of socioeconomic status based on ABS (2006) Index of Relative Socioeconomic Advantage/Disadvantage score based on the patient's area of usual residence.

Source: AIHW (2009a).

In 2007-08, the majority of patients electing to be treated as private patients were treated by private hospitals, while public hospitals treated nearly all public patients (table 4.6). Public hospitals treated 14 per cent of patients using private health insurance to fund their hospital stay. Private hospitals treated 62 per cent of Department of Veterans' Affairs patients in 2007-08.

Table 4.6 **Share of patient separations by sector and funding source, 2007-08**

	Public hospitals	*Private hospitals*	*Australia*
	%	%	%
Public patient	98	2	100
Private health insurance	14	86	100
Self-funded	17	83	100
Department of Veterans' Affairs	38	62	100
Compensation or other[a]	47	53	100
All funding sources	**60**	**40**	**100**

[a] Includes workers compensation, other compensation, motor vehicle third party personal claim, other public authorities and other funding sources.

Source: AIHW (2009a).

4.2 Relationship between the two sectors

Based on the differences in the business structures, responsibilities, services and patient profiles of public and private hospitals, there is strong support from study participants that the two sectors are fundamentally different, as noted:

> [I]t is critical to emphasise that the public and private hospital sectors are driven by different requirements. The core function may be to assemble infrastructure, workforce and knowledge around the care of patients to improve their health, but the associated 'imperatives' have created two very different structures. (Royal Australasian College of Surgeons, sub. 30, pp. 1-2)
>
> The two sectors have fundamentally different roles in that the public health system is required under the National Health Care Agreement to treat all patients that present for care, while the private sector provides preferential access to care for those who can afford it. (Tasmanian Department of Health and Human Services, sub. 37, p. 3)
>
> [P]ublic and private hospitals serve different populations, do different things, operate in very different ways and are funded differently. (Australian Healthcare and Hospitals Association, sub. 33, p. 2)
>
> For the most part, private hospitals are quite different from public hospitals in size and types of services offered. For example, private facilities in the mental health sector provide treatment for quite distinct conditions to those treated in the public sector. The majority of chemotherapy treatment for people with cancer is delivered in the private sector. Most of the rehabilitation for people who have had accidents, injuries or falls is provided in private hospitals … And nearly all in-hospital specialist palliative care services for the dying are provided in private hospitals, especially in regional Australia. (APHA, sub. 25, p. 3)

A key difference between the sectors is the type of product they deliver. For certain types of care offered by both sectors, private hospital services can be accessed relatively sooner, and with the added benefits of private ward accommodation and a choice of doctor, subject to a patient's willingness-to-pay. Based on this distinction, the two sectors are effectively delivering differentiated products. As CHA commented, the private sector has to distinguish itself from the public sector in order to attract demand:

> Given that privately insured patients have already paid for public insurance under Medicare, the private health sector, in order to attract additional funding from individuals, needs to provide a different patient experience to the public sector — particularly in areas where seemingly similar clinical services are offered. (sub. 20, p. 6)

These fundamental differences in public and private hospitals suggest that the two sectors may be described as complementary, in the sense that they provide a different range of services which supplement that of the other. Many interested parties held this view, at least with respect to some services (ACSQHC, sub. 24; Rhonda Kerr and Associates, sub. 34). Queensland Health noted:

> In general terms, … the provision of public and private health care [is] predominantly complementary rather than competitive. Therefore any competitive analysis will need to carefully address the complexities of the environment in which health care takes place across the public and private systems. (sub. 27, p. 1)

On the other hand, some study participants commented that there is little evidence that the two sectors are complementary (Centre for Health Economics, Monash University, sub. 7), while other participants pointed towards the sectors' similarities. As well as offering many of the same services, the two sectors effectively compete for the same resources, such as trained medical staff (Rhonda Kerr and Associates, sub. 34). The noted similarities between public and private hospitals suggest that, at least in some aspects, the two sectors may be described as competitive markets, sharing common functions and offering substitutable services.

Many study participants, however, concluded that the relationship between the public and private sectors is not clear cut. While some public and private hospital establishments share common features and may be seen to operate in competition, others are sufficiently distinct that they may be viewed as complementary components of the total hospital system. On this point, APHA noted:

> Private hospitals are in some aspects similar to public ones. Some of the large acute medical/surgical private hospitals provide similar services to their public sector counterparts, including accident and emergency services. However, this applies largely in the densely populated metropolitan areas. For the most part, private hospitals are quite different from public hospitals in size and types of services offered. (sub. 25, p. 3)

Likewise, the Australian Medical Association (AMA) observed that the similarities between the sectors are restricted to a select number of features:

> There are some limited areas where the two hospital sectors can be seen as being in competition with each other. However, the two sectors do have quite markedly differing casemix. (sub. 28, p. 2)

Defining the profiles of the public and private sectors is further complicated by signs of increasing overlap and interaction between them, as the Australian Government Department of Health and Ageing observed:

> The boundaries between public hospitals and private hospitals and the services provided within each sector are becoming increasingly blurred. Examples include: public hospitals provide services to private patients, while private hospitals provide services to public patients; … emergency care is provided by public hospitals and also by some private hospitals; the education and training of healthcare professionals is now occurring in some private facilities. (sub. 32, p. 12)

Similarly, the Royal Australasian College of Surgeons observed that the private hospital sector is increasingly adopting some of the traditional characteristics of the public sector:

> Historically [in the private sector] there has been an emphasis on elective or semi-elective presentations. However, there has also been a growing recognition that patients present as emergencies, and this has seen the development of emergency departments in the larger private hospitals. Patients are also referred by medical practitioners, usually specialists. Consequently another focus of the private hospital sector has been on securing a steady referral of patients, which has driven its development. (sub. 30, p. 2)

Furthermore, defining the responsibilities and incentives of each sector is complicated by the fact that a single provider can deliver services in both sectors, as CHA commented:

> In the case of the Catholic hospitals, the delineation between public and private is further confounded by the fact that a number of Catholic healthcare providers operate significant hospitals in both the public and private sectors including the St Vincent's Health Australia, Little Company of Mary Health Service and the Mater Health Service in Brisbane. (sub. 20, p. 5)

The strength of interaction between the two sectors has led some to describe them as 'interdependent' (Queensland Health, sub. 27, p. 2), reflecting the fact that the services and functions of each sector help to support the other. The interaction between the sectors may be demonstrated by, for example: the sharing of resources in co-located establishments; medical staff working across both sectors and the exchange of spillover benefits (the private sector benefiting from the public sector's investment in medical training and research). The AMA identified the benefits of Australia's dual hospital system:

> [T]he plural nature of the public and private hospital system is one of the strengths of Australia's health system. It is readily apparent that taxpayer-sourced funding cannot

bear the whole load of financing health care … Australia gets its best results when the two sectors have a strong symbiotic relationship … It makes no economic sense to have duplicated and underutilised resources in both sectors if there is scope for resources to be shared. (sub. 28, pp. 1–2)

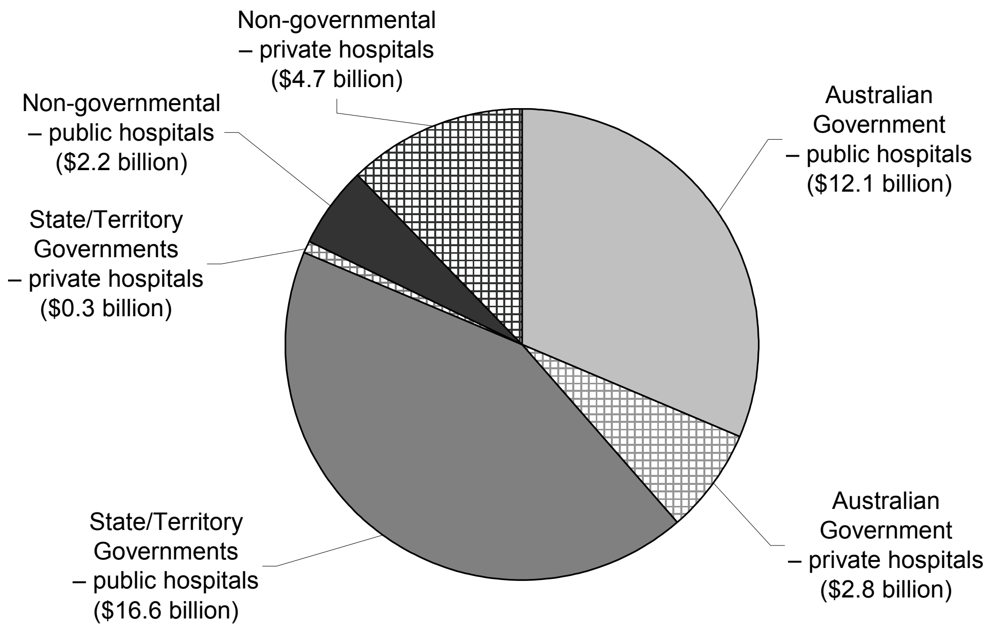
4.3 Possible directions for hospitals

Australia's hospital system is under pressure, largely due to the impact of population ageing and the associated fiscal burden, but also due to technological advancements, heightened community expectations regarding access to health care, and trends in the health status of the population. These factors are changing not only the type of hospital services sought by patients, but also how and where treatment is delivered.

Under these pressures, healthcare expenditure currently consumes around 9 per cent of Australia's GDP, of which the equivalent of 3.5 per cent of GDP is allocated to hospitals (AIHW 2009c). In 2007-08, Australian Government expenditure on hospitals amounted to $14.9 billion, most of which was allocated to public hospital services (figure 4.3). Around 13 per cent of the Australian Government's hospital expenditure was used to fund private health insurance premium rebates. In the same year, state and local government expenditure on hospitals amounted to $16.8 billion, almost all of which was directed to public hospitals. Non-governmental expenditure on hospitals amounted to $6.9 billion, most of which was directed to private hospitals. From 2005-06 to 2007-08, total government expenditure on public and private hospitals increased by 12 per cent and 9 per cent respectively. Over the same timeframe, non-governmental expenditure on public and private hospitals increased by 17 per cent and 7 per cent respectively (AIHW 2009c).

Accounting for growth in both demographic and non-demographic factors (such as medical developments), the Australian Treasury estimated that from 2006-07 to 2046-47, Australian Government expenditure on hospitals (including private health insurance rebates) will increase from 1.2 to 2.3 per cent of GDP, equivalent to a three-fold increase in real expenditure per person (Treasury 2007). Consistent with these figures, the Commission estimated that Australian Government expenditure on hospitals (excluding private health insurance rebates) will increase to 2.25 per cent of GDP by 2044-45 (PC 2005). It estimated that state and territory government expenditure on hospitals will increase to 1.9 per cent of GDP by 2044-45, up from 1.2 per cent of GDP in 2002-03 (PC 2005).

Figure 4.3 **Funding sources of public and private hospitals, 2007-08[a]**



a Expenditure on public hospital services and private hospitals.

Source: AIHW (2009c).

Given the intensified demand for hospital services, matched with increasing budgetary pressures, current policy reforms are focused on generating greater efficiency, accountability and performance quality within Australia's hospital system, and across both public and private sectors. This is especially the case with the new National Health Agreement (NHA) agreed to by COAG in late 2008. Other reform proposals, such as the recommendations of the National Health and Hospitals Reform Commission (NHHRC), are consistent with these directions.

COAG reforms

The NHA aims to change the future delivery of public hospital services. It was agreed to by COAG in December 2008 and took effect from July 2009. The Australian Government and all state and territory governments are signatories to the agreement, which declares as one of its objectives that Australians 'receive appropriate high quality and affordable hospital and hospital-related care' (COAG 2008d, p. A-4). The agreement is intended to improve the efficiency of service delivery in the public hospital sector, while also reflecting the community service obligations of small and regional hospitals.

Among the changes, the agreement proposes a range of measures designed to:

- move towards activity-based funding in public hospitals
- reduce average waiting times for elective surgery
- improve access to rehabilitation, post-acute and transition care services
- improve the quality of data on services to non-admitted patients
- improve comparative assessment of the public and private hospital sectors
- increase levels of informed financial consent for private patients in both public and private hospitals
- increase hospital quality and safety by building on the priorities of the ACSQHC.

Although the NHA reforms are primarily applicable to the public hospital sector, measures to monitor the progress of the NHA objectives will apply to the private hospital sector where relevant (COAG 2008d). Further details on the NHA are provided in appendix B.

The National Partnership Agreement on Hospital and Health Workforce Reform, agreed to by COAG in 2008, sets specific measures for the public hospital sector to:

- introduce a nationally consistent approach to activity-based funding (starting development in 2009-10 and implementation in 2013-14)
- improve health workforce capability and supply
- enhance the provision of sub-acute services
- relieve pressure on emergency departments (COAG 2008e).

Among the key budgetary measures to support the two agreements, COAG agreed to the following funding allocations:

- \$60.5 billion as a Specific Purpose Payment to the states to facilitate the objectives of the NHA
- \$750 million as a National Partnership (NP) payment in 2008-09 to relieve pressure on public hospital emergency departments
- \$500 million in 2008-09 to provide 1600 more sub-acute care beds
- \$1.75 billion as an NP payment over five years from 2008-09 to expand training programs — especially in regional hospitals — in addition to funding by state governments (COAG 2008b).

The total funding package delivered to the states as part of the NHA represents an increase of \$22.4 billion compared to the previous Australian Health Care

Agreements. The funding is targeted to facilitate higher throughput in public hospitals, with public statements suggesting the extra funding will enable 370 000 more separations, 350 000 more emergency department presentations and 2.5 million more outpatient services over four years from 2008-09 (COAG 2008a).

National Health and Hospitals Reform Commission

In June 2009, the NHHRC presented a suite of recommendations to the Australian Government proposing, among many changes, a redesign of the funding and governance arrangements of the health system, higher standards of service delivery, expanded clinical training programs and improvements in the reporting of hospital performance indicators (NHHRC 2009). Among an extensive list, the NHHRC specifically recommended:

- the use of activity-based funding for both public and private hospitals, covering inpatient, outpatient and emergency services
- the use of National Access Targets to ensure timely access and safe care in hospitals
- data reporting requirements for both public and private hospitals
- that a greater share of responsibility for the funding and delivery of health services be transferred from the states and territories to the Australian Government.

Although the recommendations of the NHHRC are largely consistent with the NHA — including the move towards activity-based funding to drive higher efficiency — some distinct changes in funding and governance arrangements are proposed. The NHHRC's recommendation that the Australian Government assume full funding responsibility for public hospitals over time would introduce a more centralised approach to health services, compared to the NHA's more collaborative Commonwealth–State approach.

Also distinct from the NHA, the NHHRC proposed a new model for health care in Australia more generally, called Medicare Select, which would build on the existing Medicare scheme. Under this new model, all patients would be covered by a 'health and hospital' plan to access their universal service Medicare entitlements, but given greater flexibility to switch to a private provider without forgoing their Medicare entitlements. The proposed new model is intended to promote greater competition between public and private health service providers, thereby improving resource efficiency.

The recommendations of the NHHRC report are currently under consideration by the Australian Government.

Private health insurance

Currently, around 45 per cent of Australians have private health insurance, which is a relatively high rate compared to most other OECD countries (OECD 2003; PHIAC 2009c). There are a number of possible reasons for Australia's high rate of coverage, including the desire for security and peace of mind expressed by those who choose to take out insurance coverage (ABS 2009b). Australia's high rate of private health insurance coverage can also be attributed, in part, to three policy measures: the Medicare Levy Surcharge, the Private Health Insurance Rebate and Lifetime Health Cover. These measures are intended to encourage those with the capacity to pay for their own private health insurance to do so, particularly at a younger age, and to maintain their membership throughout their lifetime. These policies are based on the principle that healthcare fees should be aligned, to some degree, to patients' capacity to pay. By encouraging the take-up of private health insurance, these policies are also intended to help relieve demand on the public hospital sector.

As part of the 2009-10 Budget, the Australian Government proposed a reduction in the rebate for high income earners, on the rationale that the existing scheme disproportionately favours high income earners and demands unsustainably high levels of government funding[1] (Australian Senate Community Affairs Legislation Committee 2009). In 2007-08, Australian Government expenditure on private health insurance rebates across all health services amounted to $3.6 billion, representative of a 16 per cent increase from the preceding year (AIHW 2009c). If the proposed rebate reduction does affect private health insurance membership rates, it may redirect some patients from private to public election status and consequently shift demand for certain hospital services such as elective procedures. However, the Australian Treasury estimated that the proposed changes would not significantly reduce private health insurance membership (cited by Australian Senate Community Affairs Legislation Committee 2009). Other analysts have commented that that Treasury's estimates may be understated (Access Economics, commissioned by CHA, 2009).

The NHHRC proposed that the role of private health insurance should be examined alongside its proposed healthcare model, focusing on the way in which private

---

1 This includes rebates claimed through the taxation system and rebates paid directly to health insurance funds which allow them to reduce premiums.

health insurance would complement the new system of ‘health and hospital plans’, and the potential impact of the new model on the viability of private health insurance membership and expected premiums (NHHRC 2009).

FINDING 4.1

Although there is significant diversity within and across the public and private hospital sectors in Australia, there are a number of key similarities between public and private hospitals that enable and encourage comparison between the sectors. It is acknowledged that there are some differences in the activities undertaken by public and private hospitals and that the sectors do not always service a comparable patient population, which makes comparisons more difficult.

5 Hospital and medical costs

Key points

- Comparing the costs of public and private hospitals has been one of the most challenging parts of this study because:
  - existing data collections are limited by inconsistent collection methods and missing information
  - differences between hospitals in the types of patients treated and services provided make like-for-like comparisons difficult.
- The Commission has sought to address these problems by drawing on various data sources and incorporating adjustments to make the data more comparable, but the resulting estimates should be considered experimental.
- The Commission's experimental cost estimates suggest that, at a national level, public and private hospitals had a broadly similar cost per casemix-adjusted separation in 2007-08. However, significant differences were found in the composition of costs:
  - medical and diagnostics costs and prostheses costs were higher in private hospitals
  - capital costs were estimated to be somewhat higher in public hospitals, but this result is particularly reliant on a range of data sources and adjustments to make the data more comparable
  - the combined cost of nursing and other salaries, allied health, operating rooms and specialist suites, critical care, hotel costs, supplies, and on-costs were on average higher for public hospitals.
- A disaggregation of the experimental cost estimates by diagnosis-related groups (DRGs) suggests that in 2007-08:
  - half of DRGs had an average cost in public hospitals that was more than 10 per cent higher than in private hospitals, and one-fifth of DRGs had an average cost in public hospitals that was at least 10 per cent lower than in private hospitals
  - almost three-fifths of surgical DRGs had an average cost in public hospitals that was at least 10 per cent higher than in private hospitals, and medical DRGs were where public hospitals performed most strongly in terms of costs.
- To some extent, the results reflect differences between sectors in types of patients treated and services provided, as there was a limit to which such differences could be controlled for without advanced statistical methods. Multivariate techniques are used in chapter 8 to take account of the many factors influencing performance.
- A foreshadowed shift to nationally-consistent activity-based funding for public hospitals is expected to lead to more robust cost data. However, there remains considerable scope to improve the quality and consistency of information on hospital and medical costs for both public and private hospitals.

The terms of reference direct the Commission to report comparative hospital and medical costs for clinically-similar procedures performed by public and private hospitals. This has been one of the most challenging parts of the study, particularly in the short time available, because:

- existing data collections are limited by inconsistent collection methods and missing information
- differences between hospitals in the types of patients treated and services provided make like-for-like comparisons difficult.

Many study participants raised doubts about whether meaningful cost comparisons were possible, given these difficulties (for example, Australian Healthcare and Hospitals Association, sub. 33; Australian Medical Association, sub. 28; Catholic Health Australia, sub. 20; NSW Department of Health, sub. 40; Royal Australasian College of Surgeons, sub. 30; SA Department of Health, sub. 4; Tasmanian Department of Health and Human Services, sub. 37).

Nevertheless, a number of participants acknowledged that the cost estimates were consistent with their expectations (for example, NSW Department of Health, sub. 41; Dr. John Deeble, sub. DR56; Catholic Health Australia, sub DR62).

It should also be noted that costs are a partial indicator of hospital performance, since they do not include information on other aspects of performance, such as quality and patient safety (Australian Medical Association, sub. 28). Nevertheless, there is a strong case for monitoring and comparing hospital costs, given that hospital services account for a large proportion of Australia's health spending, and competitive markets only have a limited role in driving efficiency improvements in the health sector. Indeed, governments already participate in a number of performance indicator frameworks that include the reporting of hospital costs, particularly for public hospitals (AIHW 2009a; DOHA 2009a; NHPC 2004; SCRGSP 2009). Unfortunately, these initiatives have yet to lead to comprehensive and nationally-consistent reporting of hospital costs.

The Commission has sought to address data limitations, and take account of the diversity and complexity of hospitals, by drawing on various data sources and, where necessary, incorporating adjustments to make the data more comparable. However, the Commission readily acknowledges that a number of significant data shortcomings have limited its ability to construct fully-comparable costs. The Commission therefore stresses that the cost estimates presented in this chapter should be treated as experimental.

The next section describes the cost indicators used in this report. This is followed by an overview of data sources and estimation methods. The resulting estimates are then presented. The chapter concludes with a discussion of data developments that could improve the feasibility of future cost comparisons.

5.1 Cost indicators

Two commonly-used measures of hospital costs were estimated for this study:

- cost per casemix-adjusted separation — the average cost of treating a range of different diagnoses, after controlling for differences in the complexity of required treatments (casemix adjustment)
- cost per separation — the average cost of treating a group of diagnoses that are clinically similar.

Clinically-similar diagnoses were defined according to the widely-accepted system of Australian Refined Diagnosis-Related Groups (AR-DRGs).[1] This classification system provides a clinically-meaningful way of relating types of patients treated to required resources (DOHA 2004). Individual DRGs represent a class of patients with similar clinical conditions that require similar hospital services (AIHW 2009a; Department of Health and Ageing, sub. 32).

The AR-DRG system only applies to acute-care admitted-patient services, and so it was not possible to compare costs for other hospital services. Admitted-patient services accounted for 71 per cent of the costs incurred by overnight acute-care hospitals in 2007-08 (AIHW 2009a).[2]

Casemix-adjusted separations were calculated by weighting the number of separations for each DRG by its relative complexity. In line with established practice (for example, AIHW 2009a; DOHA 2009a), the relative complexity of each DRG was measured by its cost weight — the average cost of the DRG across all relevant hospitals divided by the average cost for all DRGs.

The grouping of similar outputs by DRG, and casemix adjustment when comparing costs for more than one DRG, is an important step in making cost comparisons

1 The AR-DRG system is used by governments across Australia to measure and fund health services, with its origin dating back to the early 1990s. It is managed by the Department of Health and Ageing in consultation with state and territory health authorities, the Clinical Casemix Committee of Australia, Clinical Classification and Coding Groups, and National Centre for Classification in Health (DOHA 2004).

2 Victoria admits patients for treatments that other jurisdictions may administer as nonadmitted (outpatient) services, such as chemotherapy and dialysis, and so a disproportionate share of Victorian separations may be categorised as admitted-patient services (Victorian Department of Health, pers. comm., 30 September 2009).

more meaningful. As noted by study participants, the range and type of patients treated by a hospital (casemix) will have a major influence on its costs (Australian Nursing Federation, sub. 17; Catholic Health Australia, sub. 20; NSW Department of Health, sub. 40; SA Department of Health, sub. 4; Tasmanian Department of Health and Human Services, sub. 37).

Some participants were concerned that individual DRGs are not sufficiently homogeneous to enable like-for-like comparisons (for example, Medical Technology Association of Australia, sub. DR48; Queensland Health, sub. 27; Tasmanian Department of Health and Human Services, sub. 37; Women's and Children's Hospitals Australasia, sub. 21).

It is inevitable that any patient classification system will have some heterogeneity within individual categories, as no single patient is precisely identical to another, and so the question is whether such heterogeneity is significant and likely to prejudice any cost comparison. The Commission notes that DRGs are sometimes categorised by factors such as patient age and whether there are comorbidities, and so it appears that these factors are to some extent controlled for. In addition, the AR-DRG system has been refined over a period of more than a decade with input from national, state and territory health departments so that only patients with similar clinical conditions and resource requirements are grouped into the same DRG (DOHA 2004).

5.2 Data sources and estimation methods

The terms of reference direct the Commission to use cost data that the states and territories will provide to the Australian Government under the National Health Agreement, and private hospitals already provide to the Government. However, recent policy developments — such as a foreshadowed move to nationally-consistent activity-based funding — have yet to lead to the reporting of all costs on a comprehensive and consistent basis. The Commission therefore had to draw on various existing data sources and, where necessary, incorporate adjustments to make the data more comparable. These data sources and adjustments are summarised below, with further details provided in appendix D.

Data sources

Most of the cost data were sourced from two data collections managed by the Australian Government Department of Health and Ageing (DOHA) as part of its regulatory and oversight functions:

- National Hospital Cost Data Collection (NHCDC) — a voluntary annual survey of hospitals, with the latest published results (2007-08) based on responses from hospitals which accounted for 89 per cent of public acute separations and 72 per cent of private acute separations.
- Hospital Casemix Protocol (HCP) — a regular census of private health insurance claims in public and private hospitals, collected as part of the regulation of private health insurance. HCP data excludes both public patients and private patients who do not make a private health insurance claim (who together comprised around 90 per cent of separations in public hospitals and 20 per cent in private hospitals in 2007-08).

A key difference between the collections is that the NHCDC has data on hospital expenditure (costs), whereas the HCP has data on amounts charged to patients.

The NHCDC was used as the primary data source because it is designed for cost analysis and covers a significant share of separations in both public and private hospitals. The HCP was only used for private-patient medical and diagnostics costs, as these are not captured in the NHCDC. Other data sources — such as surveys of private hospitals by the Australian Bureau of Statistics and the National Hospital Morbidity Database — were also used where NHCDC data are incomplete.

Study participants noted that the NHCDC is the best available data source for the purpose of analysing costs, but also cautioned that it has major limitations (for example, Australian Health Service Alliance, sub. 1; Australian Unity, sub. 31; Catholic Health Australia, sub. 20). Some of the deficiencies of available cost data are outlined in box 5.1.

Around 11 per cent of DRGs (less than 2 per cent of separations) in the 2007-08 NHCDC sample were excluded from the analysis because they had few separations (episodes of care) in at least one sector, and/or involved less than three hospitals.

The Commission also obtained data from the Department of Veterans' Affairs (DVA) on the cost of treating a selected number of DRGs for veterans and their dependants. While DVA data are not necessarily representative of the whole population (Repatriation Commission, sub. 39), as a client of both the public and private hospital sectors across Australia, DVA's experience provides useful insights into the relative performance of the two sectors. In 2007-08, DVA-funded patients accounted for 4.1 per cent of all hospital separations (2.6 per cent of separations in public hospitals and 6.4 per cent in private hospitals) (AIHW 2009a).

It should be noted, however, that the DVA data are based on prices negotiated between DVA and the providers of hospital services, rather than the cost incurred by hospitals in providing those services. The extent to which there is a mark up over costs could vary across jurisdictions for public hospitals and between different operators of private hospitals. DVA cost results are presented in appendix D.

Box 5.1 **Some of the deficiencies of existing cost data**

There are inconsistencies within and between the public and private sectors in the reporting of individual cost items in the National Hospital Cost Data Collection (NHCDC) because data are provided without any auditing or reconciliation controls (Department of Health and Ageing (DOHA), sub. 32). For example:

- depreciation is not reported for Victorian public hospitals
- building depreciation is not reported for public hospitals in Queensland
- there are differences in the extent to which jurisdictions and hospitals report head-office overheads.

Another weakness of the NHCDC is that the user cost of capital is not explicitly included.

There are also key differences in the way hospitals measure costs for the NHCDC:

- 'Patient-costed' sites measure costs at the patient level. This approach is used for 75 per cent of public-hospital cost data (DOHA, sub. 32).
- 'Cost-modelled' sites allocate aggregate costs across different items using pre-determined service weights, which can be more than ten years old (Catholic Health Australia, sub. 20). As a result, reported costs are probably not as accurate as those from patient-costed sites. More than 90 per cent of private hospitals in the NHCDC report cost-modelled data (DOHA 2009b).

The NHCDC data that DOHA provided to the Commission are based on an unweighted sample, and so may not be representative of all hospitals. The data do cover a high proportion of separations in both sectors, but some types of hospitals and regions — such as large metropolitan hospitals — may be over-represented relative to others. For example, the NSW Government has noted that the majority of NSW data in the NHCDC are drawn from principal referral and major teaching hospitals, which on average are more costly due to higher infrastructure costs and a more complex casemix (DOHA 2009a). The SA Department of Health (sub. 4) estimated that teaching accounted for over 5 per cent of total costs in SA metropolitan hospitals.

Items directly billed to patients — especially medical and diagnostics costs for private patients — are not collected for the NHCDC. In such cases, charges data had to be used from the HCP, which is a census of private health insurance claims covering all hospitals. The Commission requested HCP data for only the hospitals in the NHCDC sample, but received averages based on the full HCP census population. Thus, HCP and NHCDC averages for different populations had to be used.

Estimation methods

Overall costs were estimated by summing the various items that contribute to an episode of care. Cost data on these items have varying degrees of accuracy and comparability, and so the Commission distinguished between them using the six categories listed in table 5.1.

Table 5.1 **Cost components**[a]

1. General hospital	**2. Pharmacy**	**5. Capital**
Ward nursing[b]	Pharmacy[c]	Depreciation[d]
Ward supplies & other overheads		User cost of capital[e]
Allied health	**3. Emergency**	
Critical care[f]	Emergency department[g]	**6. Medical & diagnostics**
Operating rooms		*Incurred by the hospital*
Specialist procedure suites	**4. Prostheses**	Ward medical[h]
Hotel costs	Prostheses[i]	Imaging[j]
Non-clinical salaries[k]		Pathology[l]
On-costs[m]		*Billed directly to the patient*
		Medical charges[n]

[a] Individual items are NHCDC cost buckets unless otherwise indicated. Details provided in appendix D. [b] Excludes nursing salaries and wages reported in imaging, pathology, critical care, operating rooms, emergency departments, specialist procedure suites, allied health, and pharmacy. [c] Excludes pharmacy costs reported in critical care, operating rooms, specialist procedure suites, emergency departments, pathology, and imaging. [d] Sourced from the NHCDC, except for Queensland and Victorian public hospitals, which were derived from data published in SCRGSP (2009). [e] Derived from data published by the ABS (2008e) and SCRGSP (2009). [f] Critical care covers intensive-care units and coronary-care units. [g] Emergency department cost associated with patients who are subsequently admitted. [h] Excludes medical salaries and wages reported in imaging, pathology, critical care, operating rooms, emergency departments, specialist procedure suites, allied health, and pharmacy. [i] Excludes prostheses acquired directly by patients or their doctors, rather than the hospital. [j] Excludes imaging costs reported in critical care, operating rooms, emergency departments, specialist procedure suites, pharmacy, and pathology. [k] All other costs of service provision, but primarily other salaries and wages, such as for patient-care assistants. [l] Excludes pathology costs reported in critical care, operating rooms, emergency departments, specialist procedure suites, pharmacy, and imaging. [m] Includes superannuation, termination payments, lump-sum payments, fringe-benefits tax, long-service leave, workers compensation, and recruitment costs. Excludes items paid as part of a salary package, such as salaries and wages, leave, allowances, and hotel costs. [n] Sourced from the HCP. Includes both medical and diagnostics charges.

In order to compare hospital and medical costs for similar procedures performed by public and private hospital systems it is necessary to combine a number of cost components. In particular, to build a measure of the cost of an episode of care in the private sector that is comparable to the cost of an episode of care in the public system it is necessary to combine costs from different sources — private hospitals are generally not responsible for the bulk of medical or diagnostics costs incurred in a private episode of care, rather they are billed directly to the patients by the specialists involved (Australian Health Services Alliance, sub. DR53; Australian

Private Hospitals Association, sub. DR65). In this sense, this is a comparison of costs associated with the public and private hospital systems.

The footnotes to table 5.1 are based on how costs are meant to be allocated according to the NHCDC Hospital Reference Manual (DOHA 2008c). In practice, jurisdictions do not always follow the NHCDC data specifications for public hospitals, and compliance in the private sector can also be inconsistent. For example, Victorian public hospitals record costs according to the methods of the Clinical Costing Standards Association of Australia, and these are subsequently mapped to the NHCDC cost structure. One of the consequences of this is that NHCDC data for 'ward nursing' in Victorian public hospitals include other ward costs, such as consumables, lighting and cleaning, and non-ward costs for admitted patients, such as hospital-in-the-home and maternity post-domiciliary nursing care.

FBT exemptions

The terms of reference require the Commission to take account of fringe-benefits tax (FBT) exemptions when comparing costs. Public and not-for-profit private hospitals can provide 'capped' fringe benefits up to a value of \$17 000 per employee without incurring FBT. In addition to the capped exemption, public and private not-for-profit hospitals are also eligible for the uncapped meal-entertainment exemption. The meal-entertainment exemption has the potential to confer large benefits to individuals employed by eligible institutions, and is likely to affect resource allocation and employee behaviour (PC 2009).

In order to match the post-tax salary package a given employee receives in a public or not-for-profit private hospital, it is therefore necessary for for-profit hospitals to incur an FBT liability that other hospitals are exempted from (Australian Health Insurance Association, sub. 18).

To facilitate like-for-like comparisons, the Commission estimated the cost that for-profit hospitals incur by not having access to the capped FBT exemption, and reduced their reported costs accordingly. Where the labour costs of for-profit private hospitals could be identified in the NHCDC, they were reduced by around 1.4 per cent. It was not possible to estimate the cost of the uncapped meal-entertainment exemption due to a lack of information about its use.

Capital costs

The Commission was also directed to take account of the capital costs of hospitals. This has two elements — depreciation and the user cost of capital (UCC).

Depreciation is the reduction in an asset's value due to usage and obsolescence. The NHCDC has DRG-level data on depreciation, except for public hospitals in Victoria and Queensland.[3] To address this data deficiency, aggregate public hospital depreciation reported by the Victorian and Queensland governments (and published by SCRGSP 2009) was apportioned across DRGs according to the pattern observed in other jurisdictions. It was not possible to apply a similar adjustment to cost estimates by region and hospital size, and so public hospital depreciation is understated for these disaggregations.

The UCC is the opportunity cost of the capital used to deliver services. That is, the return that could be generated if the funds tied up in the capital were employed in their next best use. The UCC for public hospitals was based on the methodology and asset data that jurisdictions have for some years contributed to for national reporting of public hospital costs under the auspices of the Steering Committee for the Review of Government Service Provision (SCRGSP 2009).[4] A similar method was applied to private hospitals, using asset values estimated from investment and depreciation data collected by the ABS (2008e).

As detailed in appendix D, the capital cost estimates are particularly reliant on a range of data sources and adjustments to make the data comparable. They could underestimate capital costs in the public sector if asset data exclude public-private partnership arrangements and contracting out of public-patient services to private operators. It appears that assets are reported inconsistently between jurisdictions. Capital costs could be underestimated in the private sector to the extent available asset data exclude leased hospitals.

Administration and corporate overheads

In recent years, concerns have been expressed about a rapid increase in hospital administrative staff relative to numbers of beds and treated patients (for example, Sammut 2009). It is difficult to fully quantify the extent of this issue, but available data do suggest that there has been some growth in administrative staff. Between 2001 and 2006, the number of medical administrators and nursing directors employed across all areas of the health system grew by 69 per cent, compared to 23 per cent for all health workers (AIHW 2008c). Data presented in chapter 7 indicate that hospital administration and clerical workers per bed increased by

3 Queensland public hospital data include non-building depreciation, but does not cover depreciation relating to buildings (DOHA 2009a).

4 The public-hospital asset data used were at a jurisdiction level. The Commission requested hospital-level asset data from each jurisdiction. Such data was not provided by all jurisdictions, and so it was not possible to use hospital-level data and maintain a consistent approach.

8 per cent in public hospitals and 19 per cent in private hospitals between 2002-03 and 2007-08. As a further comparison, the number of available or licensed hospital beds in Australia grew by 3 per cent, and the number of separations grew by 19 per cent, between 2000-01 and 2005-06 (AIHW 2006, 2009a).

It is not currently possible to separately identify the wages and salaries of administrative staff in the NHCDC data, because administrative staff are often included in the costs of their relevant work area, such as operating rooms, pathology, and emergency departments. There may also be inconsistencies between jurisdictions in how the cost of hospital administrative staff are allocated.

Furthermore, there are inconsistencies in the extent to which administrative and head-office overheads are included in the NHCDC (section 5.5). For example, costs associated with financial, payroll and human resource management services are not included in public hospital costs in Queensland (DOHA 2009a). The Commission understands that head-office costs are similarly excluded in public hospital costs from New South Wales, Victoria, South Australia, Western Australia and the ACT. In contrast, Tasmania includes a number of head office and administration costs, but has reduced the extent to which they are included over recent NHCDC collections in order to be more consistent with other jurisdictions (DOHA 2009a). The Commission also understands that insurance costs for public hospitals are often treated differently across jurisdictions — while all jurisdictions include costs associated with workers' compensation insurance, it is unclear whether other costs such as medical indemnity, public liability and building and contents insurance costs are accounted for in the NHCDC.

The extent to which hospital administration and head-office costs are included in private hospital data is unclear. While it is expected that NHCDC cost data should include shared costs where a hospital is part of a larger group, whether this extends to head-office costs is not clear, beyond the exclusion of executive costs (DOHA 2009a).

Pharmaceuticals

Accurate estimation of pharmaceutical costs incurred in public and private hospitals is hampered both by incomplete coverage of pharmaceutical expenditure and the attribution of pharmaceutical cost data to other sources. Ideally, pharmaceutical data would provide a complete picture of the cost of all pharmaceuticals routinely provided by hospitals in areas such as wards and operating theatres, the more expensive highly-specialised drugs prescribed for treatments such as chemotherapy, and other medicines obtained through prescriptions for individual hospital patients. NSW Department of Health (sub. DR64) noted that all public-patient pharmaceuticals are covered in the NHCDC. The Commission understands that this includes expensive highly-specialised drugs, where applicable.

However, the cost of medicines used to treat private hospital patients is not fully captured in either the NHCDC or HCP (Dr. John Deeble, sub. DR56), and it is unclear whether or not high-cost drugs used by patients in private hospitals would be included in the NHCDC. Data published by the AIHW (2009d) suggest that private hospitals have either substantially lower pharmaceutical costs, or up to 40 per cent of the pharmaceutical costs for patients in private hospitals are met by external arrangements, such as the (publicly-funded) Pharmaceutical Benefits Scheme.

Public hospital pharmaceutical costs are reported differently across jurisdictions. The NHCDC cost bucket for 'pharmacy' is meant to include the costs of purchase, production, distribution, supply and storage of drug products and clinical pharmacy services, including salaries and wages in the pharmacy cost centre (DOHA 2008c). Pharmacy costs reported in critical care, operating rooms, emergency departments, pathology, imaging, and specialist procedure suites are not reported separately as pharmacy costs. The Commission understands that Victoria is an exception in this respect, and includes all pharmacy costs under the pharmacy cost bucket.

It is not currently possible to separately identify the total cost of pharmaceuticals from the NHCDC data, given the allocation of pharmaceutical costs to other cost areas and variations in jurisdictional approaches. However, the Commission has obtained estimates of the amount of pharmaceutical costs included in other cost buckets, for public hospitals. For those jurisdictions that allocate costs across various different buckets, around 24 per cent of total pharmacy costs were included in operating rooms and critical care costs in 2007-08 (appendix D).

FINDING 5.1

Existing datasets on hospital and medical costs are limited by inconsistent collection methods and missing information. The Commission has sought to address these limitations by drawing on various data sources and incorporating adjustments to make the data more comparable where possible, as well as noting data deficiencies where they exist. The resulting estimates of hospital and medical costs should be considered experimental.

5.3 Cost per casemix-adjusted separation

National and jurisdiction-level estimates

The Commission's experimental cost estimates suggest that, at a national level, public and private hospitals had a broadly similar cost per casemix-adjusted separation in 2007-08 (table 5.2). There do, however, appear to be differences between jurisdictions. In New South Wales and Victoria, private hospitals were estimated to have a higher cost per casemix-adjusted separation than public hospitals. In other jurisdictions, private hospitals were estimated to have a lower cost per casemix-adjusted separation than public hospitals, with the gap particularly large in Western Australia. To some extent, these differences between jurisdictions may be attributable to inconsistencies in how each jurisdiction measures and reports costs for the NHCDC.

There were significant differences between public and private hospitals in the composition of costs. For general hospital costs, public hospitals were estimated to be more costly than private hospitals ($2552 versus $1953 at the national level). This was also the case with the experimental estimates of capital costs ($426 versus $230). Conversely, average prostheses costs were estimated to be much lower in public hospitals ($131 versus $542). Average medical and diagnostics costs were also lower in public hospitals ($798 versus $1346). A similar pattern in the cost components was evident at the jurisdiction level.

Table 5.2 **Cost per casemix-adjusted separation by jurisdiction and sector, 2007-08[a]**

Dollars

	NSW		Vic		Qld		SA	
Cost component	*Public*	*Private*	*Public*	*Private*	*Public*	*Private*	*Public*	*Private*
General hospital[b]	2 511	1 944	2 106	2 004	2 683	1 948	2 800	1 803
Pharmacy	164	42	235	87	174	45	146	53
Emergency	205	16	251	50	211	40	135	61
Medical & diagnostics[c]	733	1 497	900	1 226	794	1 404	621	1 214
Prostheses	137	620	108	527	121	491	140	495
Capital[d]	439	210	359	240	560	223	381	158
Total[e]	4 189	4 330	3 960	4 133	4 543	4 151	4 223	3 783

	WA		Tas, NT & ACT[f]		Australia	
	Public	*Private*	*Public*	*Private*	*Public*	*Private*
General hospital[b]	3 094	1 845	3 243	2 236	2 552	1 953
Pharmacy	202	144	186	55	187	68
Emergency	147	11	238	21	208	34
Medical & diagnostics[c]	1 048	1 275	725	1 391	798	1 346
Prostheses	155	555	141	540	131	542
Capital[d]	359	281	447	345	426	230
Total[e]	5 006	4 111	4 980	4 586	4 302	4 172

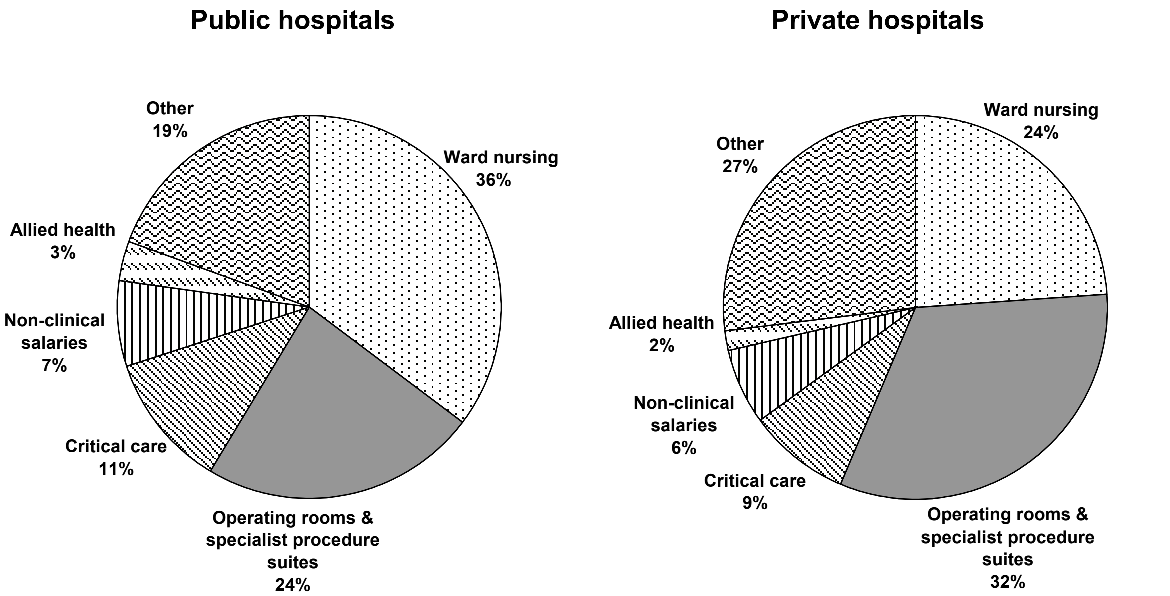
[a] Costs are casemix adjusted using DRG-level cost weights for public and private hospitals combined. [b] NHCDC cost buckets for ward nursing, non-clinical salaries, allied health, critical care, operating rooms, ward supplies and other overheads, on-costs, hotel costs, and specialist procedure suites. [c] Combination of data from the NHCDC (ward medical, imaging and pathology) and HCP (medical charges, which in the HCP includes diagnostics). [d] Depreciation and the user cost of capital. [e] Totals may not equal sum of components due to rounding. [f] Data for Tasmania, the Northern Territory and the ACT are aggregated to protect the confidentiality of the small number of hospitals in each of these jurisdictions.

Source: Productivity Commission estimates.

General hospital costs

The relative significance of individual items within the general hospital category differed between the public and private sectors (figure 5.1). To some degree, this could reflect differences in how costs are allocated between different items, rather than genuine variation in the composition of costs. The extent of this issue is unknown. As noted later, some medical costs for public hospitals are captured in this general hospital category, rather than the medical cost bucket.

Figure 5.1 **Composition of general hospital costs by sector, 2007-08[a]**



[a] Care should be taken in interpreting this figure due to differences between jurisdictions in how public hospital costs are reported. The differences may cause public-hospital nursing costs to be overstated, and supplies and on-costs to be understated. Costs were casemix adjusted using a 'general hospital' cost weight for this figure. 'Other' comprises NHCDC cost buckets for ward supplies and other overheads, hotel costs and on-costs.

Source: Productivity Commission estimates.

Nevertheless, general hospital costs in aggregate differed significantly between the sectors. It was estimated that, in 2007-08, the general hospital cost per casemix-adjusted separation was about 30 per cent higher in public hospitals compared to private hospitals. Based on the reported data, it appears that this was largely due to greater expenditure on ward nursing per separation in public hospitals. There was also a sizeable difference in the average cost of critical care. Critical care covers intensive-care and coronary-care units, and so the estimated difference in average costs might reflect the fact that most of these units are in public hospitals.

Medical and diagnostics

Medical and diagnostics costs are incurred differently in the public and private hospital systems. In the public sector, such costs generally relate to the wages and salaries of doctors and specialists, whereas in the private sector they largely (though not exclusively) consist of fees charged to patients by doctors and are not under the control of the hospital in which treatment is performed (Australian Health Service Alliance, sub. DR53; Australian Private Hospitals Association, sub. DR65).

Medical and diagnostics costs were estimated to make up a greater proportion of the total cost associated with the treatment of patients in private hospitals than they do in public hospitals (32 per cent compared to 19 per cent), with the difference estimated to be $548 at the national level. At a jurisdictional level, the gap between public and private medical and diagnostics costs was estimated to range from as little as $227 in Western Australia to $764 in New South Wales (table 5.2).

However, the estimated differences between public and private hospitals in medical and diagnostics costs should be interpreted with care. Around one-third of public-patient medical costs in the NHCDC are embedded in the general hospital and emergency categories (estimated to be around $268 per separation nationally, as detailed in appendix D). Hence, the experimental estimates overstate the cost advantage that public hospitals have in medical and diagnostics, and the cost disadvantage that public hospitals have in general hospital and emergency departments.

Catholic Health Australia (sub. DR62) noted that the estimated medical and diagnostics costs for public hospitals in New South Wales presented in the Discussion Draft for this study was inconsistent with Catholic Health Australia's experience and unexpectedly low. Catholic Health Australia referred to an interjurisdictional comparison of payments made to Visiting Medical Officers and salaried and sessional staff (AIHW 2009a). It is worth noting that medical and diagnostics costs associated with 'ungroupable' HCP separations have been included in the Commission's estimates since the publication of the Discussion Draft, and this has increased the estimated medical and diagnostics costs for public hospitals in New South Wales (appendix D).

It should also be noted that the Commission's experimental estimates for medical and diagnostics costs are broadly consistent with comments from other study participants, who observed that:

- doctors in private practice tend to charge higher fees to private patients to compensate for the lower earnings they receive from treating public patients in public hospitals (often described as cross subsidisation) (Australian Health Service Alliance, sub. 1; Australian Medical Association, sub. 28)
- there may be less incentive to limit medical costs in the private sector (Prof. Richard Harper, sub. 6).

Prostheses

As with medical and diagnostics costs, prostheses costs are actively managed and borne by public hospitals, while private hospitals are limited in their ability to control them:

> [M]ost prostheses are actually purchased by the hospital and supplied to the patient by the hospital — although the choice of prosthetic devices is made by the treating doctors. (Catholic Health Australia, sub. DR62, p. 6)

At a national level, the cost of prostheses per casemix-adjusted separation was much greater for procedures performed in private hospitals than in public hospitals. A similar disparity was evident in all jurisdictions, but was greatest in New South Wales and Victoria. The relatively high estimated cost of prostheses in private hospitals is consistent with the views of participants (for example, Australian Health Services Alliance, sub. 1). However, comments by CHA suggest that the estimated disparity between sectors may be at least partly attributable to data deficiencies:

> … the arrangements for the management and purchasing of prostheses in both sectors are quite different and should be excluded from this particular study. In particular, whilst the private sector has detailed prostheses billing data (a requirement for reimbursement), this does not apply in the public sector where prostheses tracking is less detailed and usually modelled using weights rather than actual utilisation. To put this into perspective, prostheses can be over 20 per cent of costs in some hospitals, depending on the casemix. (sub. 20, p. 9)

Nevertheless, the Commission considered it important to include prostheses costs in this study, given that they can account for a large share of costs for some types of treatment. In addition, the Commission has reported prostheses costs separately from other items so that readers can see how they affect total cost per casemix-adjusted separation.

Differences in prostheses costs should be considered carefully as they reflect not only differential pricing of prostheses between the public and private sectors, but also the effect of bulk-purchasing arrangements in the public sector, and a wider range of often higher-priced products being available in the private sector (Australian Private Hospitals Association, sub DR65; Catholic Health Australia, sub. DR62; Medical Technology Association of Australia, sub. DR48).

At an aggregate level, participants suggested that the Commission's method for estimating prostheses costs may overstate the relative difference between public and private sectors, due to there being proportionally fewer cases with significant prostheses costs in the public sector (for example, Australian Health Services Alliance, sub. DR54). This means that there are a large number of separations over which the total prostheses expenditure is spread.

In order to provide an indication of prostheses costs for procedures where they are commonly used, the Australian Health Service Alliance (sub. DR53) suggested that the prostheses cost per casemix-adjusted separation be calculated using only DRGs with an average prostheses cost over $30 per separation. Using this approach, the Commission estimated that the prostheses cost per casemix-adjusted separation — using this constrained segment of separations and DRGs — was $790 and $1514 in public and private hospitals respectively in 2007-08.[5]

Capital costs

The Commission's experimental estimates suggest that capital costs account for a notable proportion of total costs in both sectors, and so should be included in any cost comparison. This is consistent with broader data published by the Australian Institute of Health and Welfare (AIHW 2009c), which show that capital expenditure on health facilities and investments accounted for 5.4 per cent of Australia's total health spending in 2007-08.

At a national level, the Commission's experimental estimates suggest that capital cost per casemix-adjusted separation in public hospitals was over 80 per cent higher than in private hospitals. This is largely due to a significant difference between sectors in the estimated UCC. The Commission's experimental estimates suggest that, in 2007-08, the UCC per casemix-adjusted separation was around $280 in public hospitals, compared to around $100 in the private sector.

The Commission acknowledges that this result is particularly reliant on a range of data sources and adjustments to make the data comparable, with the experimental UCC estimates for both private and public hospital thought to be at the lower range of the spectrum. This is particularly apparent with the private sector UCC estimates, which rely on asset values estimated using a perpetual inventory model (appendix D).

NSW Department of Health (sub. 41; sub. DR64) and Dr. John Deeble (sub. DR56) favoured a different approach in which profits were used to measure the UCC for private hospitals. Such an approach is likely to be misleading because many private hospitals are run on a not-for-profit basis. A further problem is that it would confuse profits recorded for accounting purposes with the economic concept of the UCC (appendix D). Nevertheless, despite using a different methodology, both NSW

5 Using the Commission's DRG-level cost estimates for the Discussion Draft, the Australian Health Service Alliance (sub. DR53) estimated the prostheses costs per casemix-adjusted separation for public and private hospitals to be $782 and $1512 respectively. These figures are slightly different to those presented above due to revision of the cost estimates since the Discussion Draft.

Department of Health and Dr. Deeble appear to have reached a similar conclusion to that found by the Commission. NSW Department of Health (sub. 41) estimated that the average amount of capital used per bed in public hospitals is much higher than in private hospitals ($388 000 versus $244 000 per bed). Dr. Deeble (sub. DR56) agreed that capital costs would be significantly higher in public hospitals compared to private hospitals.

The Commission's results are also consistent with comments from other study participants:

> A presentation given by the Queensland Department of Health in 2008 … on the development of the new Queensland Children's Hospital indicates that the cost per bed for the 360 public hospital beds is in the order of $3.055 million per bed or $14 763 per square metre. This compares with current costs from the acute private hospital sector in Queensland of around $5000 per square metre for high-cost areas such as operating theatres and $3500 per square metre for areas such as patient wards/rooms and administrative offices. The differential is in the order of 250–300 per cent. (Australian Private Hospitals Association, sub. 25, p. 8)

> Whilst it is always difficult to directly compare construction costs in the healthcare environment, the UCH [UnitingCare Health] experience over the last two years has shown that construction costs per bed (excluding equipment and professional fees) is around $450 000. (UnitingCare Health, sub. 15, p. 2)

The Commission undertook a sensitivity analysis to test the robustness of its conclusion on the relative size of capital costs in the public and private sectors. This showed that capital costs were higher in public hospitals than private hospitals under a range of plausible assumptions (appendix D).

Costs by region and hospital size

The previously noted pattern in the cost components was also evident by region and hospital size (tables 5.3 and 5.4). That is, general hospital and capital costs were lower in the private sector, whereas prostheses, and medical and diagnostics costs were lower in the public sector.

Based on the estimates, it appears that total cost per casemix-adjusted separation was essentially the same for public and private hospitals in major cities. Total cost was also estimated to be similar across sectors in inner regional areas, and for very large and large hospitals. However, private hospitals were estimated to have lower costs than public hospitals when located in outer regional areas, and when of medium to very small size.

Table 5.3 **Cost per casemix-adjusted separation by region and sector, 2007-08[a]**

Dollars

	Major cities		*Inner regional*		*Outer regional*	
Cost component	*Public*	*Private*	*Public*	*Private*	*Public*	*Private*
General hospital[b]	2 552	1 948	2 373	2 013	2 802	1 718
Pharmacy	192	71	181	49	155	33
Emergency	215	37	202	14	142	–
Medical & diagnostics[c]	792	1 360	866	1 246	813	1 406
Prostheses	136	557	123	468	104	308
Capital[d]	362	229	227	193	254	143
Total[e]	4 249	4 204	3 972	3 983	4 270	3 609

	Remote[f]		Very remote[f]	
	Public	*Private*	*Public*	*Private*
General hospital[b]	3 712	..	4 947	..
Pharmacy	124	..	209	..
Emergency	316	..	292	..
Medical & diagnostics[c]	707	..	776	..
Prostheses	11	..	1	..
Capital[d]	343	..	381	..
Total[e]	5 212	..	6 607	..

[a] Regions are based on ABS *Australian Standard Geographical Classification (ASGC)*, Cat. no. 1216.0. Costs are casemix adjusted using DRG-level cost weights for public and private hospitals combined. [b] NHCDC cost buckets for ward nursing, non-clinical salaries, allied health, critical care, operating rooms, ward supplies and other overheads, on-costs, hotel costs, and specialist procedure suites. [c] Combination of data from the NHCDC (ward medical, imaging and pathology) and HCP (medical charges, which in the HCP includes diagnostics). [d] Depreciation and the user cost of capital. [e] Totals may not equal sum of components due to rounding. [f] There are no private hospitals in remote and very remote regions. .. Not applicable. – Nil or rounded to zero.

Source: Productivity Commission estimates.

Table 5.4 **Cost per casemix-adjusted separation by hospital size and sector, 2007-08[a]**

Dollars

	Very large		*Large*		*Medium*	
Cost component	*Public*	*Private*	*Public*	*Private*	*Public*	*Private*
General hospital[b]	2 591	2 007	2 408	1 922	2 361	1 836
Pharmacy	203	82	165	48	127	45
Emergency	209	48	241	21	183	5
Medical & diagnostics[c]	816	1 393	762	1 324	840	1 310
Prostheses	139	614	110	500	124	405
Capital[d]	358	222	373	267	402	227
Total[e]	4 317	4 365	4 060	4 082	4 037	3 827

	Small		*Very small*	
	Public	*Private*	*Public*	*Private*
General hospital[b]	2 629	1 774	3 150	1 929
Pharmacy	105	42	102	87
Emergency	115	–	56	–
Medical & diagnostics[c]	769	1 346	711	629
Prostheses	102	299	22	16
Capital[d]	436	212	465	224
Total[e]	4 157	3 673	4 507	2 885

[a] Hospital size defined by annual casemix-adjusted separations as follows: very large (more than 20 001), large (10 001 to 20 001), medium (5001 to 10 000), small (2001 to 5000), and very small (up to 2000). Casemix adjustment for the purpose of allocating hospitals to a size group was undertaken by DOHA using separate cost weights for public and private hospitals. The casemix adjustment used by the Productivity Commission to calculate costs was based on DRG-level cost weights for public and private hospitals combined. [b] NHCDC cost buckets for ward nursing, non-clinical salaries, allied health, critical care, operating rooms, ward supplies and other overheads, on-costs, hotel costs, and specialist procedure suites. [c] Combination of data from the NHCDC (ward medical, imaging and pathology) and HCP (medical charges, which in the HCP includes diagnostics). [d] Depreciation and the user cost of capital. [e] Totals may not equal sum of components due to rounding. – Nil or rounded to zero.

Source: Productivity Commission estimates.

Hospitals that are very small, or located in a remote or very remote region, were estimated to have relatively high costs per separation, even after casemix adjustment. This is consistent with the view that remote and small hospitals face additional costs because of their remoteness and/or inability to achieve the scale economies of larger establishments in more densely populated regions. The Tasmanian Department of Health and Human Services (sub. 37) cautioned that the scale inefficiencies of small hospitals also tend to increase the cost of larger public hospitals, because the larger hospitals in a health network often provide administrative support for smaller hospitals.

Some participants were concerned that inclusion of the relatively costly remote and very remote hospitals in other comparisons — national, jurisdiction and hospital size — biased the results in favour of private hospitals, since all remote and very remote hospitals are in the public sector. However, this effect is likely to be relatively minor and would not change the broad conclusions in this chapter. In the 2007-08 NHCDC sample provided by DOHA, only 5.4 per cent of hospitals and 1.6 per cent of separations in the public sector were in remote and very remote regions (appendix D). For very small hospitals these proportions were larger — 15 per cent of hospitals and 21 per cent of separations for very small public hospitals were in remote or very remote regions — but remote and very remote establishments still accounted for a minority of the public-sector sample.

Excluding remote and very remote hospitals from the cost analysis would has a limited impact on the overall cost per casemix-adjusted separation. It was estimated that the cost per casemix-adjusted separation for public hospitals would decrease by around \$10 at a national level, and around \$1 for Queensland, \$16 for South Australia, \$4 for Western Australia, and \$52 for Tasmania, the ACT and NT combined.[6] It is estimated that the cost per casemix-adjusted separation for small and very small public hospitals would fall by \$116 (2.8 per cent) and \$224 (5 per cent) respectively if remote and very remote hospitals were excluded from the analysis.

Very large hospitals were estimated to have among the highest cost per casemix-adjusted separation. This probably reflects the tendency of the largest hospitals to treat patients with the most complex clinical conditions, maintain a capability for major trauma events that is rarely used, and provide a large proportion of clinical training.

6 Excluding remote and very remote hospitals does not change reported estimates for public hospitals in New South Wales or Victoria, as the NHCDC sample had no hospitals in these jurisdictions within the remote or very remote category.

FINDING 5.2

The Commission's experimental cost estimates suggest that, at a national level in 2007-08, public and private hospitals had broadly similar costs per casemix-adjusted separation. There were, however, significant differences in the composition of estimated costs:

- *the combined cost of nursing and other salaries, allied health, operating rooms and specialist suites, critical care, hotel costs, supplies, and on-costs were on average higher for public hospitals*
- *medical and diagnostics costs were higher for private hospitals, although there are some recognised constraints with available data not separately identifying all medical costs in public hospitals*
- *prostheses costs were higher in the private sector, but this is also likely to reflect a broader range of products being available for use in private hospitals compared to the public hospital sector*
- *capital costs were estimated to be somewhat higher for public hospitals, but the extent of this result is particularly reliant on a range of data sources and adjustments to make the data more comparable.*

These differences were also evident when the estimates were disaggregated by jurisdiction, region and hospital size.

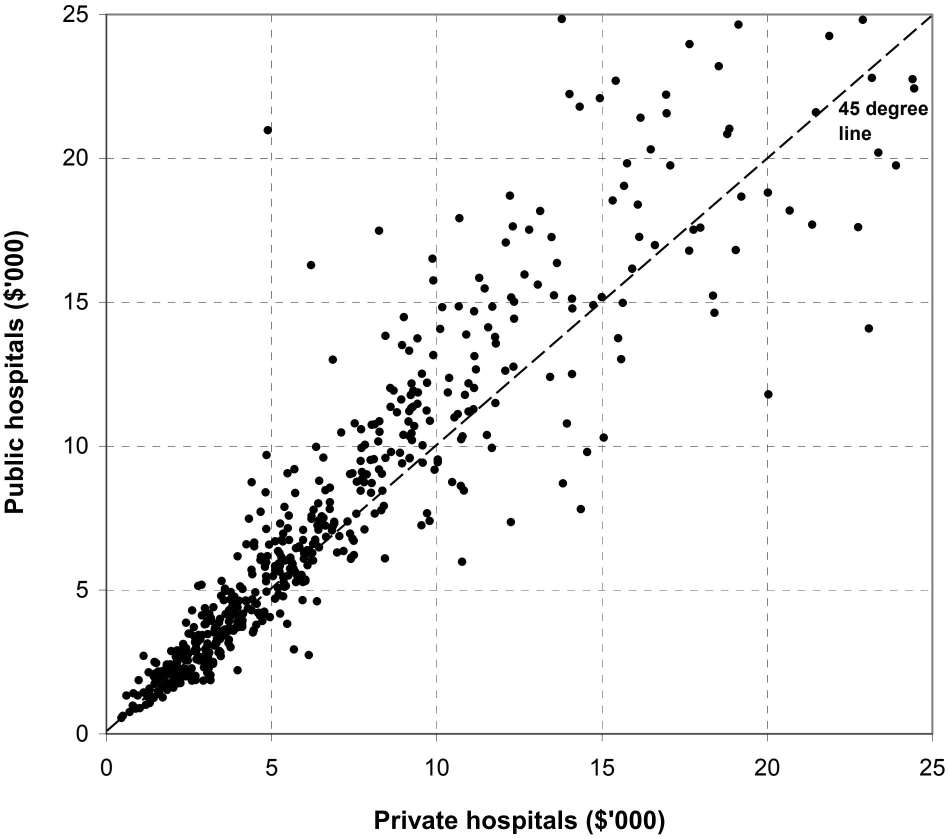
5.4 Average cost of individual DRGs

The experimental cost estimates for individual DRGs can be downloaded from the Commission's website at http://www.pc.gov.au/projects/study/hospitals. These cover 592 DRGs and are available by jurisdiction, region and hospital size.

In summary, the DRG-level cost estimates suggest that, in 2007-08, many DRGs had broadly similar costs in public and private hospitals. This is evident from clustering around the 45 degree line in figure 5.2, which compares the cost per separation for individual DRGs in the public and private sectors.

Nevertheless, it is also apparent that the cost in one sector relative to the other varies between DRGs. This variation can be examined by using a measure of relative cost — the ratio of cost per separation in public hospitals relative to that in private hospitals. If a DRG has a public-private cost ratio of one, it indicates that public and private hospitals have the same cost per separation. A ratio of less than (more than) one indicates that the cost per separation is lower (higher) in public hospitals relative to private hospitals.

Figure 5.2 **Comparison of cost per separation for individual DRGs in public and private hospitals, 2007-08[a]**



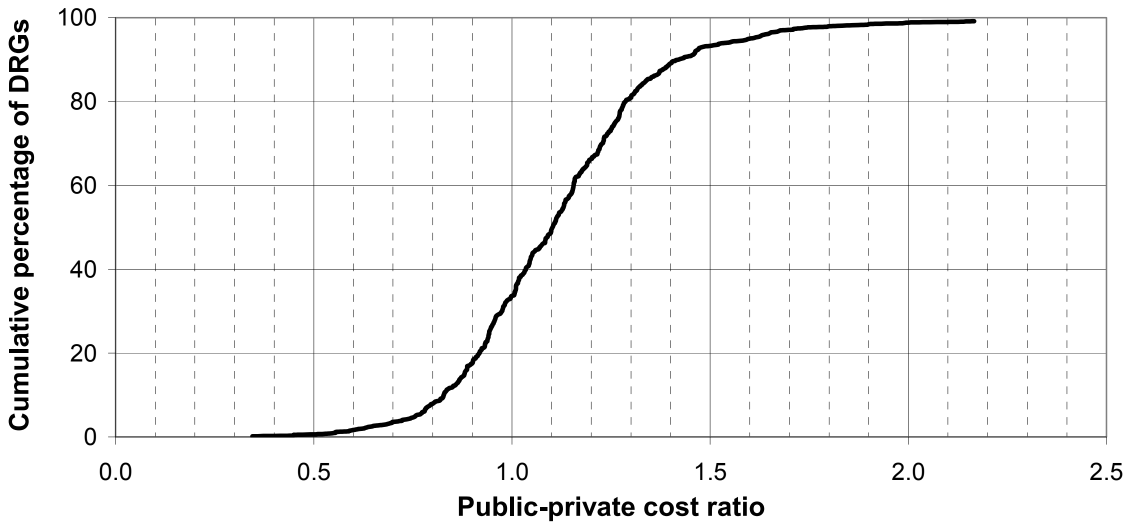
[a] A point is located above (below) the 45 degree line if the relevant DRG has a higher (lower) cost per separation in public hospitals than in private hospitals. DRGs with a cost per separation of more than $25 000 in at least one sector are not shown on the graph. These excluded DRGs accounted for less than 1.5 per cent of separations among the sampled DRGs and hospitals.

Source: Productivity Commission estimates.

In figure 5.3, DRGs are ranked from the lowest public-private cost ratio to the highest, and graphed against their cumulative share of all DRGs.

Given the experimental nature of the estimates, the Commission suggests that there is no discernable difference in cost between sectors if the estimated cost of a DRG in public hospitals is within 90 to 110 per cent of the cost in private hospitals (a public-private cost ratio in the range of 0.9 to 1.1). Around 32 per cent of the analysed DRGs were estimated to have an average cost per separation in public hospitals that was within this range. These DRGs accounted for 29 per cent of separations and 40 per cent of aggregate costs among the sampled DRGs and hospitals.

Figure 5.3 **Cumulative distribution of DRGs ranked by public-private cost ratio, 2007-08[a]**



[a] The public-private cost ratio measures cost per separation for a DRG in public hospitals relative to that in private hospitals. A ratio of one indicates that, for the relevant DRG, public and private hospitals have the same cost per separation. A ratio of less than (more than) one indicates that the cost per separation is lower (higher) in public hospitals. Three DRGs with a public-private cost ratio of more than 2.5 are not shown on the graph. These excluded DRGs accounted for about 0.04 per cent of separations among the sampled DRGs and hospitals.

Source: Productivity Commission estimates.

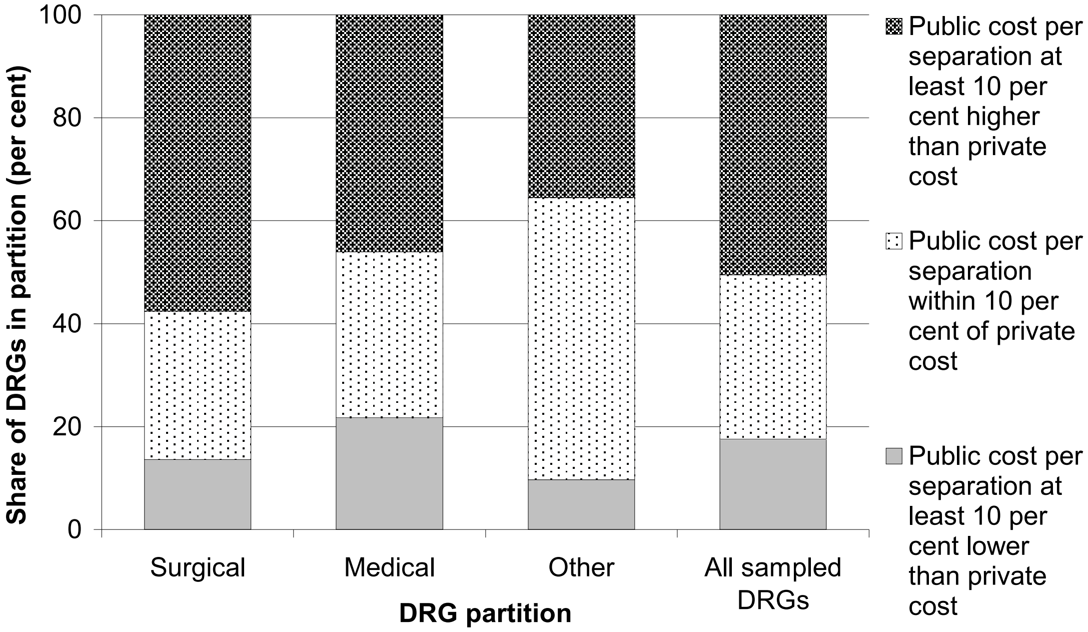
Around 18 per cent of the analysed DRGs were estimated to have an average cost per separation in public hospitals that was at least 10 per cent lower than in private hospitals (a public-private cost ratio of less than 0.9). These DRGs accounted for 22 per cent of separations and 20 per cent of aggregate costs among the sampled DRGs and hospitals.

Around 50 per cent of the analysed DRGs were estimated to have an average cost per separation in public hospitals that was more than 10 per cent higher than in private hospitals. These DRGs accounted for 48 per cent of separations and 40 per cent of aggregate costs among the sampled DRGs and hospitals.

DRG partitions and Major Diagnostic Categories

Under the DRG classification system, individual DRGs can be grouped into the 'partitions' of surgical, medical or other. The experimental estimates suggest that almost three-fifths of surgical DRGs had a cost per separation in public hospitals that was at least 10 per cent higher than in private hospitals (figure 5.4). Medical DRGs were where public hospitals performed most strongly in terms of cost relative to the private sector, with 22 per cent of medical DRGs having a cost per separation in public hospitals that was at least 10 per cent lower than in private hospitals. Nearly one third of medical separations occur in these DRGs.

Figure 5.4 **DRG partitions by public cost relative to private cost, 2007-08[a]**



[a] Separations are assigned to the surgical, medical or other partitions on the basis of whether the separation involves a procedure, and whether that procedure requires an operating room. A procedure is a clinical intervention that carries a procedural or anaesthetic risk, and/or requires specialised training, facilities or equipment. A separation is classified as surgical if it involves at least one operating-room procedure; medical if there is no procedure; and other if it involves a procedure performed outside of an operating room, such as dental extractions and colonoscopies.

Source: Productivity Commission estimates.

Around 55 per cent of the DRGs classified as 'other' were found to have no clear cost difference (a cost per separation in public hospitals between 90 and 110 per cent of the cost in private hospitals).[7] The strong performance of private hospitals in surgical and other DRGs could reflect their tendency to specialise in relatively routine procedures, whereas public hospitals have to provide a broader range of services and manage the potentially disruptive effects of emergency admissions (Queensland Health, sub. 27; SA Department of Health, sub. 4; Tasmanian Department of Health and Human Services, sub. 37).[8]

[7] A separation is classified as 'other' if it involves a procedure performed outside of an operating room, such as dental extractions and colonoscopies.

[8] Chapters 2 and 3 of this report discuss emergency departments in public and private hospitals respectively.

The DRG classification system also enables DRGs to be grouped into over 20 different Major Diagnostic Categories (MDCs). The Commission's experimental estimates suggest that, in 2007-08, cost per separation in public hospitals was:

- over 10 per cent *higher* than in private hospitals for almost half the MDC groups
- between 90 and 110 per cent of that in private hospitals for half the MDC groups
- over 10 per cent *lower* than in private hospitals for only one MDC (diseases and disorders of the circulatory system).[9]

FINDING 5.3

A disaggregation of the Commission's experimental cost estimates by diagnosis-related groups (DRGs) suggests that in 2007-08:

- *nearly one-fifth of DRGs had an average cost in public hospitals that was at least 10 per cent lower than in private hospitals, and about half of DRGs had an average cost in public hospitals that was more than 10 per cent higher than in private hospitals*
- *almost three-fifths of surgical DRGs had a cost per separation in public hospitals that was at least 10 per cent higher than in private hospitals, and medical DRGs were where public hospitals performed most strongly in terms of cost relative to the private sector.*

Casemix complexity

A number of participants asserted that, where public hospitals have a higher cost per casemix-adjusted separation than private hospitals, this is because public hospitals have a more complex casemix (for example, Queensland Health, sub 27; Tasmanian Department of Human Services, sub. 37).

To investigate this issue, the Commission examined the relative importance (in terms of separations) of individual DRGs in each sector, and their associated cost weight. As noted above, a cost weight measures a DRG's average cost across all hospitals, relative to the average cost for all DRGs across all hospitals. Cost weights are commonly used as an indicator of the relative complexity of a DRG, and to calculate an overall casemix-adjusted cost per separation.

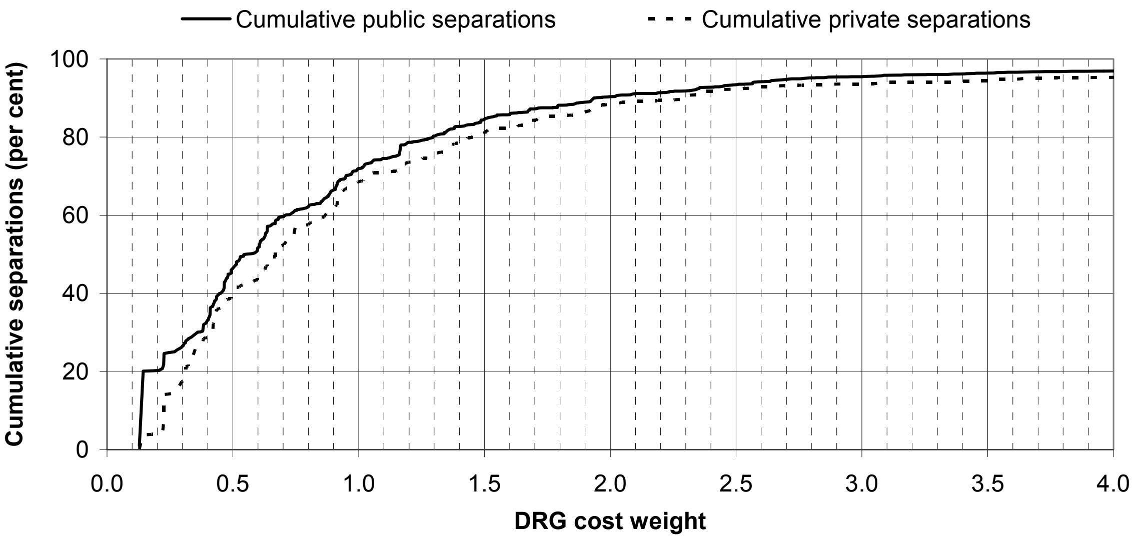
The Commission estimate that the average cost weight for DRGs in public hospitals was 0.96 in 2007-08, suggesting that the overall casemix of public hospitals is

9 Cost per casemix-adjusted separation was estimated for each MDC by dividing the total cost over all separations in that MDC by the total number of cost-weighted separations in that MDC.

slightly less complex than that of private hospitals.[10] The average cost weight for DRGs in private hospitals was estimated to be 1.09.

In figure 5.5, DRGs are ranked from the lowest cost weight to the highest in each sector, and graphed against their cumulative share of separations. It can be seen that, in 2007-08, public hospitals had a greater share of their workload in DRGs with a relatively low cost weight. Around 25 per cent of separations in public hospitals had a cost weight of less than 0.25, in comparison to 14 per cent in private hospitals.

Figure 5.5 **Cumulative distribution of separations in each sector ranked by DRG cost weight, 2007-08[a]**



[a] DRG cost weight is the average cost for each DRG relative to the average cost for all DRGs. DRGs with a cost weight of more than four are not shown on the graph. There are 86 DRGs not shown, which accounted for 3.1 per cent of public separations and 4.7 per cent of private separations in the NHCDC sample.

Source: Productivity Commission estimates.

Differences in average cost weights are largely driven by the different number of separations in low-cost and high-volume DRGs, such as renal dialysis and chemotherapy, that are experienced in the public and private sectors. When the renal dialysis and chemotherapy DRGs are excluded from the calculations, the average cost weights converge to equal 1.00 in both the public and private sectors.

[10] This was calculated as a weighted average, where the weights were the number of separations for each DRG.

5.5 Improving future cost comparisons

As noted previously, the cost estimates in this report should be considered experimental, since they are based on datasets with inconsistent collection methods and missing information. In addition, there was a limit to which differences between the public and private sectors — such as types of patients treated and services provided — could be controlled for without using advanced statistical methods. Multivariate techniques are used in chapter 8 to take account of the many factors influencing hospital performance.

The remainder of this chapter outlines foreshadowed improvements to the collection and reporting of cost data, and considers what other improvements could be made to improve the feasibility of future comparisons of public and private hospitals.

Foreshadowed improvements to data collections

In late 2008, the Council of Australian Governments (COAG) made the National Partnership Agreement on Hospital and Health Workforce Reform, in which jurisdictions agreed to introduce a nationally-consistent approach to activity-based funding (ABF) for public hospitals. (COAG 2008e). This will involve development of a nationally-consistent costing and funding model for all care types and all non-clinical hospital services, including teaching and research. The costing model is to be built on the NHCDC.

The Australian Government committed $154 million from 2008-09 to 2012-13 to fund the ABF initiative, with $133 million of this to be allocated to the states and territories. It was agreed that the Australian Government would provide national leadership and coordination for the development of classification systems and costing models.

Specific performance targets were outlined for the development of ABF infrastructure in the COAG partnership agreement:

- By 30 June 2011, 100 per cent of admitted-patient episodes are to be classified and costed using a nationally-consistent model.
- By 30 June 2015, 100 per cent of emergency-department services, sub-acute, outpatient services and hospital-auspiced community health services are to be classified and costed using a nationally-consistent model.
- If agreed by COAG, by 30 June 2016, 100 per cent of admitted-patient episodes, emergency department, sub-acute outpatient services and hospital-auspiced

community health services are to be funded through a nationally-consistent ABF model.

These developments would go a long way towards addressing the problems that the Commission has encountered with existing cost data for public hospitals. It would, however, be desirable for all private hospitals to report cost data using the same methodology as public hospitals. It is notable therefore that the COAG partnership agreement gives the Australian Government responsibility, in collaboration with states and territories, to engage with the private sector to improve the comparability of performance between the public and private sectors. DOHA (sub. 32) noted that steps have already been undertaken in this regard.

However, at this stage it appears that participation in the NHCDC will remain voluntary for private hospitals. It is unlikely that this will ensure that the quality and comparability of private hospital data improves. Catholic Health Australia, representing a large proportion of private hospitals, noted that it:

> … supports compulsory participation of the private sector in contributing to the cost data collections and for data input into these collections to be made consistent across all jurisdictions and between the public and private sectors. (sub. DR62, p. 2)

The Australian Health Service Alliance (sub. 1) suggested that consideration be given to making it mandatory for all hospitals, or at least all hospitals other than the very small ones, to provide data to the NHCDC.

Participants suggest that there may be scope to rationalise and improve consistency with other reporting requirements — including to the HCP as part of the regulation of private health insurance — so that there is not a major additional reporting burden on private hospitals from being required to participate in the NHCDC (Australian Private Hospitals Association, sub. 25; Catholic Health Australia, sub. DR62; DOHA, sub. 32). DOHA noted:

> … anecdotal evidence suggests that some private facilities may contribute to as many as nine different collections with different formats and requirements, and those that have facilities in different jurisdictions may have up to eight different reporting regimes to comply with for very similar information. (sub. 32, p. 28)

Similarly, the Australian Private Hospitals Association (sub. 25, p. 6) called for a rationalisation of the ‘existing plethora of regulation and reporting requirements imposed on private hospitals’.

Catholic Health Australia (sub. 20; sub. DR62) advocated the establishment of an Office of Hospital Cost Data within DOHA to oversee a nationally-consistent data collection for both public and private hospitals. It also recommended that, with the implementation of ABF for public hospitals, Commonwealth funding to the states should be made contingent on them providing data that are consistent and high quality. In addition, an independent data audit agency was proposed to ensure the quality of submitted data.

Capital costs

The Commission's experimental estimates for capital costs are particularly reliant on a range of data sources and adjustments to make the data comparable. While the precise value of capital costs remains open to debate, the Commission considers that this item is likely to account for a notable share of total costs and so should be included in data collections.

The shift to a nationally-consistent data collection for ABF purposes may partially address problems with the reporting of depreciation, as this item is already covered by the NHCDC, but it is unclear what will be done to measure the UCC. This will require consistent approaches to measuring asset values, which is currently not the case, particularly for public hospitals. For private hospitals, the total value of assets is not currently available, and so the Commission had to estimate it from investment and depreciation data collected by the ABS (2008e). Thus, there is a strong case for including asset values, reported on a consistent basis, for both public and private hospitals in the NHCDC. This would need to include assets subject to public-private partnership arrangements, contracting out of public-patient services to the private sector, and the use of leased assets.

Items billed directly to patients

It is unclear how the move to a nationally-consistent data collection for ABF purposes would address problems with identifying medical and diagnostics costs for private patients. The Commission has had to rely on HCP data for these items, but public hospitals often fail to assign private-patient costs to DRGs when coding HCP data. To address this problem, it was necessary to apportion unassigned medical costs across DRGs by using separation data for private patients in public hospitals and private hospital cost weights (appendix D).

It would be desirable for all costs associated with an episode of care — including those directly billed to patients, such as medical, diagnostic and pharmaceutical costs — to be captured in the new national cost collection.

Prostheses

The Commission's experimental estimates suggest that the cost of prostheses in public hospitals is considerably lower than in private hospitals. As noted previously, this is consistent with the expectations of study participants, but there may also be problems with how prostheses costs are currently reported. The NHCDC data obtained by the Commission seem to have noticeably different prostheses costs across separations within a particular DRG and sector. The Commission understands that changes are being considered for the next round of the NHCDC to address some of the problems with the reporting of prostheses costs.

Hospital administration costs and head-office overheads

As noted previously, concerns have been expressed in recent years about a rapid increase in hospital administrative staff relative to numbers of beds and treated patients. As noted above, it was not possible to separately identify the wages and salaries of administrative staff in the NHCDC data, because administrative staff are often included in the costs of their relevant work area, such as operating rooms, pathology, and emergency departments. There are also inconsistencies between jurisdictions in how the costs of administrative staff are allocated. There are opportunities for improvements in data to respond to these identified deficiencies.

Study participants noted that head-office overheads — such as for centralised procurement of supplies and provision of information-technology services — should also be included in cost comparisons as they are part of the cost of supplying hospital services (for example, Australian Health Insurance Association, sub. 18; Australian Medical Association, sub. 28; Australian Private Hospitals Association, sub. 25). There are currently inconsistencies between jurisdictions/hospitals in the extent to which head-office overheads are reported in the NHCDC, and this is not clearly documented. The Commission understands that the Technical Reference Group for the NHCDC — comprising representatives from the jurisdictions and private hospital groups — has been considering an approach to collect head-office overheads consistently in future cost data collections.

FBT exemption

As noted above, the Commission has attempted to achieve like-for-like comparisons by removing the FBT liability that for-profit private hospitals incur due to not having access to the FBT exemption available to public and not-for-profit hospitals. This involved adjusting the NHCDC cost data for ward medical, ward nursing, and non-clinical salaries. It is possible that this adjustment only partially accounts for the additional FBT burden faced by for-profit hospitals, since some labour costs are incorporated into other NHCDC cost buckets. Ideally, the adjustment would be applied to the NHCDC cost bucket for on-costs, as this is where FBT is supposed to be included by reporting hospitals (DOHA, sub. 32). However, the Commission did not have access to data on the proportion of on-costs that were FBT payments.

Pharmaceuticals

As noted above, the cost of medicines used to treat hospital patients is not fully captured by the NHCDC. Ideally, the data would include the cost of medicines routinely provided by hospitals in areas such as wards and operating theatres, the more expensive highly-specialised drugs prescribed for treatments such as chemotherapy, and other medicines obtained through prescriptions for individual hospital patients (including those currently subsidised under the Pharmaceutical Benefits Scheme and provided through community pharmacies).

FINDING 5.4

A foreshadowed shift to nationally-consistent activity-based funding for public hospitals is expected to eventually lead to more robust cost data for the public sector. However, there remains considerable scope to improve the quality and consistency of hospital and medical cost data in Australia. In particular, there is a need for:

- *private hospitals to report cost data using the same methodology as public hospitals, and to continue to have a high level of participation in the National Hospital Cost Data Collection, so that the data are reliable and can be disaggregated by sector, region, and size and type of facility*
- *items directly billed to private patients — such as some medical, diagnostics and medicines — to be linked with cost data reported by hospitals so that all costs associated with an episode of care are captured in a single collection*
- *reliable data on capital costs, hospital administration costs, head-office overheads, and the cost of medicines prescribed to hospital patients*
- *quantification of the additional FBT liability that for-profit hospitals incur by not having the FBT exemption that is available to other hospitals.*

This may require a strengthening of data-related provisions in the National Healthcare Agreement for public hospitals, and data-reporting requirements for private hospitals. If this is the case, governments need to be conscious of the regulatory burden on reporting hospitals and, where possible, seek to limit it by avoiding duplication and inconsistency in reporting arrangements, and by utilising cost-effective electronic reporting of data.

6 Hospital-acquired infections

Key points

- Infections are the most common complication affecting hospital patients, and in many cases are preventable. A recent study estimated that Australia has 180 000 hospital-acquired infections annually and these occupy almost two million bed days.
- A simple comparison of infection rates across hospitals may not provide an accurate indication of the potential for performance improvements and associated benefits because:
  - the risk of infection depends on patient characteristics (such as age) and types of treatments provided (such as surgery), and these vary between hospitals
  - there are many different types of infections, with varying degrees of prevalence and potential harm.
- In order to take account of this diversity, it is common to limit comparisons to groups with a similar risk of infection (such as patients in intensive-care units) and distinguish infections by organism (such as *Staphylococcus aureus*) and body location (such as surgical sites). However, these methods do not remove all of the factors outside the control of a hospital that can cause its infection rate to differ from other establishments.
- A further problem is that Australia does not have a robust nationally-consistent data collection for comparing hospital-acquired infections. The currently available national data were not designed for cross-hospital comparisons, and may be affected by issues such as sample-selection bias and unaudited self-reporting.
- Data collected by state governments as part of their infection-surveillance programs suggest that private hospitals have lower infection rates than public hospitals. However, this result could be misleading because private hospitals generally treat patients who have a lower risk of infection, and the data do not fully control for this.
- Foreshadowed developments — such as performance reporting under the National Healthcare Agreement — will move Australia closer to a robust nationally-consistent data collection on hospital-acquired infections. However, there is scope for further reforms, such as including private hospitals in national reporting arrangements.
- The Australian Commission on Safety and Quality in Health Care is leading and coordinating initiatives that should improve the feasibility of future infection-rate comparisons.

The terms of reference ask the Commission to compare the rate of hospital-acquired infections in public and private hospitals, disaggregated by type of infection. This is an important indicator of service quality because infections are the most common complication affecting hospital patients, and in many cases are preventable. Hospital-acquired infections also place a significant burden on the health system, with an estimated 180 000 cases in Australia each year that occupy almost two million bed days (Graves, Halton and Robertus 2008).

In this chapter, the Commission identifies the key types of hospital-acquired infections; considers how infection rates should be compared between hospitals; undertakes a comparison between public and private hospitals using available data; and outlines developments to make future comparisons more feasible and robust.

6.1 Types of hospital-acquired infections

In 2008, the Australian Commission on Safety and Quality in Health Care (ACSQHC) published a detailed report on healthcare-associated infections (Cruickshank and Ferguson 2008). The study observed that, in order to make monitoring tractable, the approach has generally been to focus on infections of greatest concern, based on prevalence and/or harm to individual patients. The key types of infection are usually defined by organism, physical location and/or patient population:

- Organisms that have developed resistance to standard antibiotics — such as methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant *enterococci* (VRE), and multiresistant gram-negative bacteria — are often the focus of reporting regimes because they have the greatest impacts on health systems in developed countries. Another organism that is gaining prominence is *Clostridium difficile*.[1]
- Physical locations of greatest concern, and hence often reported, are surgical sites and the bloodstream.
- Patient populations considered to have a high risk of acquiring and/or experiencing significant harm from an infection — such as newly-born infants and patients in intensive-care units (ICUs) — are also often a priority for monitoring programs.

The ACSQHC report recommended that all hospitals should monitor hospital-acquired infections because this, combined with timely feedback, has been proven to reduce infection rates. The report identified major deficiencies in

1 Further details about these organisms are provided in the following parts of section 6.1.

Australia's existing monitoring arrangements and recommended strengthened surveillance of high-priority organisms, locations and populations (detailed later in this chapter).

Issues associated with high-priority organisms, locations and populations are outlined below because they have implications for how infection rates should be compared across hospitals.

Infection organisms

Staphylococcus aureus

Staphylococcus aureus — sometimes termed golden staph — is a type of bacteria often found on the skin and in the nose with no apparent ill effects. People with this condition are said to be colonised (bacteria present, but not causing an infection). However, if *Staphylococcus aureus* enters the body through broken skin, such as surgical wounds, it can cause an infection and require treatment with antibiotics. *Staphylococcus aureus* is responsible for the largest proportion of healthcare-associated bacterial infections (Cruickshank and Ferguson 2008).

Staphylococcus aureus is usually spread by direct skin contact (typically via hands) with a person who is infected or colonised, or through contact with shared items, such as towels and shared surfaces like door handles, taps and benches.

A distinction is often made between methicillin-sensitive *Staphylococcus aureus* (MSSA) and MRSA.[2] In most Australian hospitals, MSSA remains a more common cause of healthcare-acquired infections, and is likely to have a larger impact on the health system than MRSA (Christiansen et al. 2008). However, MRSA is not uncommon and can be more serious for individual patients because it has developed resistance to many antibiotics.

MRSA was traditionally associated with hospital admissions. However, in recent years community-acquired MRSA — involving people who have not recently been hospitalised or had a medical procedure — has been a growing problem (Nimmo et al. 2006). MRSA infections in the community are usually manifested as skin infections, such as pimples and boils, and occur in otherwise healthy people (SA Department of Health 2008).

---

2 Resistance to methicillin is traditionally used as an indicator of antibiotic resistance because it used to be the drug of choice for treating *Staphylococcus aureus* infections. MRSA can be subdivided into organisms that are multiresistant (resistant to multiple antibiotics) and not multiresistant (only resistant to methicillin).

Research undertaken for the ACSQHC found that MRSA infections were the second-most costly adverse event per patient (after post-procedure endocrine and metabolic disorders), adding an extra $19 892 to the cost of an episode of care (based on 2005-06 data for Victoria and 2006-07 data for Queensland) (Jackson, Ngheim, Rowell, Jorm and Wakefield 2009). The next most costly adverse event was *Clostridium difficile* that caused enterocolitis (inflammation of the colon and small intestine), costing $19 745 per episode.

Clostridium difficile

Clostridium difficile is an anaerobic toxin-producing bacterium that has an ability to form spores, which enable it to survive in the environment for extended periods of time (Thomas and Riley 2003). The organism usually causes diarrhoea and is the most common cause of healthcare-associated gastrointestinal infection (TIPCU 2009). A new virulent strain emerging in North America and Europe has led to epidemics and extensive mortality (Cruickshank and Ferguson 2008).

The main risk factor for *Clostridium difficile* colonisation and infection is prior exposure to antibiotics, possibly because antibiotics disrupt the normal balance of bacteria and other micro-organisms in the gut, allowing *Clostridium difficile* to spread (Thomas and Riley 2003).

Most cases of *Clostridium difficile* occur in hospitals or long-term care facilities. Transmission usually occurs through shared equipment, a contaminated environment or the hands of healthcare workers. The organism can be readily cultured from inanimate environmental sources such as beds, cupboards, floors and walls, as well as from the hands of healthcare workers caring for patients with a *Clostridium difficile* infection. The impact of *Clostridium difficile* on the health-care system is considerable, with patients requiring additional infection-control precautions and specific treatment, and can spend an extra 1 to 3 weeks in hospital (McGregor, Riley and Van Gessel 2008).

The ACSQHC has recommended that surveillance systems for *Clostridium difficile* be established nationally (Cruickshank and Ferguson 2008; TIPCU 2009).

Vancomycin-resistant enterococci

Vancomycin is an antibiotic used to treat infections caused by *enterococci*, which are bacteria normally residing in the bowel without causing any illness. However, *enterococci* can invade other parts of the body and cause an infection. The most common sites of enterococcal infection are the urinary tract, wounds, blood and heart lining (SA Department of Health 2009b).

Some *enterococci* have become resistant to vancomycin. These vancomycin-resistant *enterococci* (VRE) infections are harder to treat because of their antibiotic resistance. VRE infections are dangerous for people with a weakened immune system, but most recover with appropriate antibiotic treatment. However, the cost of containing VRE outbreaks in health facilities can be considerable. A 2003 outbreak in a large WA teaching hospital was brought under control over a three-month period at a cost of $2.7 million (Christiansen et al. 2004).

VRE infections are typically spread by physical contact with faeces, or skin or objects that have been contaminated with VRE. This includes contact with contaminated hands, hospital equipment, bathroom taps and door handles. Hand washing is one of the best ways to prevent the spread of VRE. Regular cleaning of frequently-touched surfaces is also important because VRE can survive in the environment for a long time (SA Department of Health 2009b).

VRE colonisation of patients is more common than infection. It is estimated that for every patient detected as having VRE, there will be at least ten others in an institution who are colonised. Colonised patients and their immediate physical environment act as reservoirs for the ongoing transmission of VRE within hospitals (Mascinie and Bonten 2005; TIPCU 2009).

Multiresistant gram-negative bacteria

Gram-negative bacteria are a group of organisms that can be identified by using a ‘gram-staining’ test. These bacteria are of concern because they can have a highly-transmissible resistance to antibiotics (Christiansen et al. 2008).

Mortality rates of up to 100 per cent can occur from gram-negative bacteria infections if the bacteria are resistant to multiple antibiotics (that is, multiresistant gram-negative bacteria) and are not treated with an antibiotic that is active against the organism. The risk of experiencing a multiresistant gram-negative bacteria infection is greater for people admitted to a teaching hospital, treated in an ICU, having other medical conditions, being treated with a central intravenous line or urinary catheter, having a longer stay in hospital, and being previously treated with antibiotics (Christiansen et al. 2008).

Infection locations

Surgical-site infections

Surgical-site infections (SSIs) result from a range of organisms. Skin flora — such as *Staphylococcus aureus* and coagulase-negative staphylococci — are most often responsible for SSIs that follow 'clean procedures'. SSIs from 'contaminated procedures' can be associated with polymicrobial infection and flora normally found in the viscus that is opened, such as gram-negative infections following rectal surgery. The range of organisms causing SSIs is also influenced by the choice and timing of prophylactic antibiotics prior to surgery (Bull et al. 2008).

SSIs can be difficult to monitor because more than 50 per cent become apparent after discharge from hospital, and any associated readmission may not be to the establishment where the surgery occurred. For example, SSIs can occur up to four weeks after deep-incisional surgery, and up to 12 months after joint-replacement surgery (HQCC 2009).

The risk of experiencing an SSI, and the associated adverse impacts, differ between surgical procedures and according to patient characteristics. For example, Bull et al. (2008) noted that infection rates tend to be low for major-joint prosthesis replacements, but the consequences of infection are significant. The patient may require further surgery, removal of the prosthetic joint, replacement with another joint, and months of intravenous antibiotic therapy, followed by oral antibiotic therapy. In other procedures, such as caesarean sections, infection rates tend to be much higher, but the consequences are less severe and may not even require readmission to a hospital.

The ACSQHC recommended routine local surveillance of SSIs, including coronary artery bypass graft surgery, major-joint prosthesis insertion, and other procedures that have higher-than-expected SSI rates at the local level (Cruickshank and Ferguson 2008).

Bloodstream infections

Bloodstream infections (BSIs) occur when the blood contains bacteria (in which case the infection is termed a bacteraemia) or fungi (fungaemia). Collignon et al. (2008, p. 53) noted that BSIs can have significant adverse impacts:

> Studies in Australia document that 17–29 per cent of patients with hospital-acquired BSIs die while still in hospital. Patients who develop BSIs are also more likely to suffer complications during their hospital stay that result in a longer hospital stay and an increased cost of hospitalisation.

Staphylococcus aureus bacteraemia (SAB) is the most common type of healthcare-associated BSI (Collignon et al. 2008). SAB cases are detected when *Staphylococcus aureus* is isolated in a blood culture. An often-cited study by Collignon et al. (2005) estimated that Australia has around 7000 SAB cases per year. The authors concluded that approximately one-half of all SAB cases were hospital acquired, and a further one-sixth were linked to healthcare procedures in other settings. The remaining one-third were deemed to be community-acquired BSIs.

MSSA strains are responsible for the largest share of hospital-acquired SAB cases, but MRSA incidence is significant. Collignon et al. (2005) estimated that MRSA accounted for around 40 per cent of Australian hospital-onset episodes of SAB. Overseas evidence indicates that the median death rate for MSSA SAB infections is 25 per cent, and for MRSA SAB infections is 34 per cent (Cosgrove et al. 2003).

Most healthcare-related SAB cases are attributed to intravascular catheters. SAB rates are therefore important markers of intravenous catheter management and the effectiveness of hand hygiene within a hospital or institution. Catheter-associated BSIs are a particular problem in intensive-care patients and immunocompromised patients who depend on artificial vascular access.

BSIs used to be mainly acquired during hospitalisation, but this situation is changing as increasing numbers of people are managed at home with intravascular catheters, have medical procedures performed as outpatients, or are discharged early from hospitals with percutaneous (through-the-skin) invasive medical devices in place.

The ACSQHC recommended mandatory reporting by hospitals of SAB BSIs, central-line associated BSIs in ICUs, and haemodialysis-access-associated BSIs (Cruickshank and Ferguson 2008).

Patient populations

As noted above, certain populations are more likely to acquire a particular type of infection. For example, *Staphylococcus aureus* is a greater concern for those who have undergone major surgery. Other patient populations that are often the focus of infection indicators are newly-born infants and ICU patients. They have a relatively high risk of acquiring an infection and experiencing significant harm, including possibly death. The ACSQHC recommended routine monitoring of bacterial sepsis for babies during the first week of life (Cruickshank and Ferguson 2008).

6.2 How should infection rates be measured and compared?

The measurement and comparison of infection rates is not straightforward. A hospital could have a relatively high infection rate simply because its workload is concentrated on services and patients with a high risk of infection. It is also desirable to take account of heterogeneity between different infection organisms and their location in the body. A hospital could have the same rate of total infections as its peers, but the infection organisms and locations could be far more serious.

Data presented in earlier chapters show that the types of services provided and patients treated can differ markedly between hospitals, both within and between the public and private sectors. It therefore follows that a comparison of infection rates in public and private hospitals could encounter difficulties in separating the effects of casemix differences from genuine differences in the performance of hospitals in reducing and managing the rate of infections. The difficulty of the task was noted by several study participants:

> Meaningful comparison of rates of HAIs [hospital-acquired infections] will be difficult, and needs to test whether there are fundamental differences between the public and private hospital casemix. (ACSQHC, sub. 24, p. 5)
>
> While hospital-acquired infections are an important indicator of quality they must be compiled and assessed carefully lest they mislead. Some common problems include comparing hospitals with significantly different casemix, considering so many infection indicators that any analysis is too granular and drawing conclusions that are not statistically robust. On top of this there [is] what is potentially the most confounding influence of all — is the relevant data complete and accurate? (Australian Health Service Alliance, sub. 1, p. 6)

A significant amount of work has been done overseas to implement methodologies that enable hospitals to compare their infection rates from one period to the next, and against best practice in other hospitals. This has been prompted by research that shows that the monitoring of hospital-acquired infections, combined with a prevention program that uses the data to drive improvements, can lead to lower infection rates (Clezy et al. 2008).

The US National Nosocomial Infections Surveillance (NNIS) system, which began in 1970, has played a leading role in establishing methodologies for comparable infection rates. The methods developed by the NNIS have underpinned surveillance programs in many other countries. Advanced national surveillance programs now exist in countries such as the Netherlands, Belgium, Brazil, Canada, Denmark, France, Germany, Norway, Sweden and the United Kingdom. Participation in the

NNIS has been shown to have significantly reduced BSIs, SSIs, urinary-tract infections and pneumonia in ICU patients in the United States. In Europe, studies have found that German and Dutch infection surveillance programs have led to reductions of 24–57 per cent for SSIs and 20–29 per cent for ICU infections (Clezy et al. 2008).

Australia has yet to implement a national surveillance regime for hospital-acquired infections, but studies of infection monitoring in individual hospitals and states have confirmed that monitoring can reduce infections (Collignon et al. 2006). In addition, multi-hospital surveillance regimes do exist in varying forms within individual Australian jurisdictions, and these are in part based on NNIS methodologies (detailed in section 6.3).

The ACSQHC (sub. 24) stressed that it is desirable to use a statistical technique that accounts for risk differences when comparing infection rates across hospitals. A common way of doing this is to subdivide infections data into groups with a similar risk of infection, and only compare infection rates within those groups. Such groups could be defined by patient characteristics, procedure and/or type of hospital. The ACSQHC (sub. 24) suggested that such groupings would preferably be defined by patient population characteristics (including procedure profile), but should at least be defined by the peer groups (identified by scale and services provided) used for national reporting on public hospitals (detailed in AIHW 2009a). However, the ACSQHC noted that the peer group classification system would need to be revised because it does not currently include private hospitals.

A popular approach for grouping SSIs with similar risks is to stratify the data using a risk index developed by the US National Healthcare Safety Network (NHSN) (formerly the NNIS) (box 6.1). However, some recent studies have found that the NHSN/NNIS risk index does not always provide an accurate measure of risk (including studies of Victorian and Queensland infections by Friedman et al. 2007 and Clements et al. 2007 respectively). This has caused some SSI monitoring programs to use a modified version of the NHSN/NNIS methodology, including those in Queensland and Victoria (CHRISP 2003; Victorian Department of Human Services 2008a).

Box 6.1 **NHSN/NNIS risk index for SSIs**

The NHSN/NNIS (National Healthcare Safety Network/ National Nosocomial Infections Surveillance System) risk index is widely used internationally, including in Australia, to enable the comparison of groups with similar risks of experiencing an SSI. The risk index is calculated by summing scores for three characteristics:

- physical status
- length of surgery
- wound class.

The resulting index has four possible values — zero, one, two or three — with a higher value indicating there is a greater risk of having an SSI. The scoring system for each characteristic is outlined below.

ASA classification of physical status

The physical status of patients undergoing general anaesthesia is categorised using a system developed by the American Society of Anaesthesiology (ASA). Patients categorised under the ASA system as having severe systemic disease, or being moribund and not expected to survive without the operation, are given a score of one for physical status. Other patients are given a physical-status score of zero.

Length of surgery

If the surgery has a longer duration than 75 per cent of comparable procedures, based on a database of past procedures, then a score of one is assigned for length of surgery. Other patients are given a length-of-surgery score of zero.

Wound class

If the surgical team classifies a surgical wound as being 'contaminated' or 'dirty infected', using a classification system adapted from guidelines developed by the US Centres for Disease Control and Prevention, then a score of one is assigned for wound class. Other patients are given a wound-class score of zero.

Source: CHRISP (2003); Cruickshank and Ferguson (2008); WA Department of Health (2008).

The WA Government's infection-surveillance unit cautioned that the NHSN/NNIS risk index does not control for all risk differences between public and private hospitals:

> … there are almost certainly key patient-risk factors that are not incorporated into this [NHSN/NNIS risk stratification] method, and that systematically differ between patients having surgery at private and public hospitals.
>
> For example, diabetic control, obesity and cigarette smoking are among known risk factors for SSIs that are not modifiable by hospitals and are not specifically incorporated into NHSN risk stratification. (Health Care Associated Infection Unit, Communicable Disease Control Directorate, Department of Health WA, sub. 38, p. 4)

Another factor that is not controlled for in the NHSN/NNIS risk index is the volume of each procedure performed by a hospital. Units performing more joint replacements have lower infection rates for the same patient risk group (Dailey, Van Geesel and Peterson 2009; Katz et al. 2001). However, NSW Health (sub. DR64) suggested that 'SSI is not related to volume but is clearly related to the frequency and application of best practice "bundles" of care'.

Another method for dealing with risk differences is the Standardised Infection Ratio (SIR). This is calculated as the number of observed infections divided by the number of expected infections. Expected infections can be based on an historical database of infection rates across multiple hospitals that is stratified into different risk groups (such as procedures). The usefulness of the SIR depends on the relevance and accuracy of that benchmark data. An SIR of more than one indicates that there are more infections than expected, and a SIR less than one indicates fewer infections than expected.

6.3 Available evidence on hospital-acquired infections

National data

The Commission identified two potential sources of national data on hospital-acquired infections that cover both public and private hospitals:

- the Clinical Indicator Program (CIP), which is managed by the Australian Council on Healthcare Standards (ACHS)
- the National Hospital Morbidity Database (NHMD), which is managed by the Australian Institute of Health and Welfare (AIHW).

These sources are discussed below.

ACHS Clinical Indicators Program

The CIP collects a large number clinical indicators from hospitals, including 47 of which measure healthcare-associated infections linked to specific procedures.[3] These are grouped into five broad categories:

- SSIs (18 indicators)

[3] Health care-associated infections are measured by 47 out of 49 indicators collected under the ACHS Infection Control Indicators Version 3 (two indicators measure staff exposure to blood and bodily fluids, which may not necessarily result in an infection).

- central-line associated BSIs (14 indicators)
- BSIs associated with dialysis (5 indicators)
- neonatal infections (6 indicators)
- MRSA cases (4 indicators).

Published data for these indicators suggest that infection rates rarely differ between the public and private hospital systems. In 2007 (the latest published data), only four of the 47 CIP indicators of healthcare-associated infections had a statistically significant difference between public and private hospitals (table 6.1).[4] In the few cases where such differences were evident, the data suggest that the private sector consistently outperformed the public sector. However, this could be misleading because the CIP is not designed to monitor the relative performance of the public and private sectors. It is a service offered to individual healthcare providers to help them improve their service quality (ACHS, sub. 13). As a result, the CIP data have a number of limitations:

- participation in the CIP is voluntary, and so the sample may not be representative of either the public or private sectors (sample-selection bias)
- the number of reporting hospitals is often small, and so sample sizes may not be sufficient to reach robust conclusions about the relative performance of a particular sector
- hospitals self-report data without external validation, and have the option of only reporting indicators of interest to them
- there is no risk adjustment to reflect differences in patient characteristics.[5]

For 2007 (the latest published data), a total of 284 hospitals reported infection-control indicators to the ACHS.[6] But CIP participants are not obliged to report every indicator because some may not be relevant to services provided by their organisation. As a result, individual infection-control indicators were based on

---

4 This was also the case in 2006 (based on data published in ACHS 2007) and in 2008 (based on unpublished data the ACHS provided to the Commission).

5 The CIP indicators do to some extent stratify the data according to risk, since in many cases the indicators are specific to a certain type of procedure/treatment and/or whether an infection occurred in an ICU.

6 The ACHS (sub. 13) advised that its (yet to be published) 2008 infections data will be based on responses from 292 hospitals, with 128 of these in the public sector and 164 in the private sector.

samples that ranged from 1 to 142 hospitals in 2007, with the median sample being only 13 hospitals (ACHS 2008).[7]

Table 6.1 **ACHS infection indicators that differed between public and private hospitals, 2007[a]**

			Infection rate[b]		No. of reporting hospitals	
Indicator no. and description[c]		*Units*	*Public*	*Private*	*Public*	*Private*
1.2	Deep incisional SSI in hip prosthesis procedures[d]	per 100 procedures	0.99	0.63	38	96
1.17	Superficial incisional SSI in abdominal hysterectomy	per 100 procedures	2.02	0.94	16	37
5.2	ICU-associated new MRSA healthcare-associated infections in a nonsterile site	per 10 000 ICU overnight occupied bed days	16.70	7.18	25	23
5.4	Non ICU-associated new MRSA inpatient healthcare-associated infections in a nonsterile site	per 10 000 non-ICU overnight occupied bed days	2.77	1.11	68	59

[a] The ACHS identified an indicator as differing between the public and private sectors if public/private status explained at least 10 per cent of the variation in sampled infection rates, and statistical testing showed that the probability of a difference between public and private rates was at least 95 per cent. However, as noted in the main text, the data may not be suitable for public-private comparisons due to sample-selection bias, small sample sizes, self-reporting, and no risk adjustment to reflect differences in patient characteristics. [b] Mean infection rates after applying the shrinkage estimation method to the data. [c] The following abbreviations are used: ICU (intensive-care unit); MRSA (methicillin-resistant *Staphylococcus aureus*); and SSI (surgical-site infection). [d] The ACHS (sub. 13) advised that unpublished data for 2008 showed that indicator 1.2 was 0.68 per 100 procedures for private hospitals and 1.02 for public hospitals.

Source: ACHS (2008).

In addition, Clezy et al. (2008) claimed that the methods used to collect the CIP indicators could vary widely between facilities because they are not precisely specified, and there is limited training on applying indicator definitions and on best-practice methods for detecting infections.

National Hospital Morbidity Database

The National Hospital Morbidity Database (NHMD) contains patient-level data from almost all hospitals in Australia on diagnoses, procedures and external causes of injury. It is compiled by the AIHW from data supplied by state and territory

7 Excluding the two infection-control indicators that measure staff exposure to blood and bodily fluids, which were based on samples of 198 and 202 hospitals respectively.

health authorities. The Australia Health Insurance Association (AHIA, sub. DR58) encouraged the Commission to use data from the NHMD as a source of information on hospital-acquired infections. However, the AIHW advised that NHMD data from 2007-08 and previous years cannot reliably identify whether a health condition arose during care. These data have not been used by the Commission for reporting on hospital-acquired infections.

For 2008-09, the NHMD coding standards were revised to include a 'condition-onset flag' that identifies whether a health condition arose during an episode of care (Australian Government Department of Health and Ageing, sub. 32).[8] This, in combination with codes for specific infection organisms and locations, could be used to identify different types of hospital-acquired infections, such as VRE urinary-tract infections.

However, the AIHW advised the Commission that infections data from the 2008-09 NHMD will not be available until after this study is completed. Similar data were, however, obtained from the Victorian Government, which has for many years required hospitals to identify conditions that arose during an episode of care. These data are detailed in appendix F, and were used in the Commission's analysis of state-level data below.

State-level data

Given the limitations of national infections data, the Commission decided to also draw on evidence collected by state governments. Government monitoring of hospital-acquired infections is largely undertaken by state governments, reflecting their role as providers of public hospitals and regulators of private hospitals.

Details about the data collected by individual jurisdictions and what they show about infection rates in public and private hospitals are provided in appendix F. In summary, the data are not collected and reported on a nationally-consistent basis, but public and private hospitals are included in most cases (the exceptions are New South Wales and the Northern Territory). However, government infection surveillance programs in Victoria, Queensland and Tasmania only began collecting information from private hospitals recently, and so limited data are available. The Commission was able to obtain additional data for Victoria, derived from that state's morbidity database. Western Australia has the most transparent reporting of results for public and private hospitals, and provided the most comprehensive data from its surveillance regime for this study.

8 NHMD data are coded according to the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM).

The different collection and reporting methods across jurisdictions mean that it is not possible to construct national estimates of hospital-acquired infections from state-level data, or to generally compare across jurisdictions. Nevertheless, the data show a consistent pattern within jurisdictions — for a given type of infection, private hospitals have a lower rate of hospital-acquired infection than public hospitals. However, this result could be misleading because private hospitals generally treat patients who have a lower risk of infection, and the data do not fully control for this. The pattern evident in the state-level data should therefore be interpreted with caution.

It is also evident from the state-level data that infection rates can vary over time. This could be due to a range of factors, including the occurrence of a pandemic and a change in adherence to infection-control procedures in hospitals.

FINDING 6.1

Australia does not have a robust nationally-consistent data collection on hospital-acquired infections. The limited available evidence suggests that private hospitals have lower infection rates than public hospitals, but this result could be misleading because private hospitals generally treat patients who have a lower risk of infection. A more definitive finding will require the development of data collections that enable risk differences between hospitals to be distinguished from genuine differences in performance.

6.4 Developments to improve future comparisons

It is evident from the preceding analysis that Australia's inconsistent and sometimes less-than-comprehensive approaches to monitoring hospital-acquired infections hinders comparisons across hospitals. This is of concern, given that studies have shown that monitoring and benchmarking, combined with a prevention program that uses the data to drive improvements, can reduce the rate of infections. Consumers Health Forum of Australia (sub. DR59) shared this concern, advocating mandatory reporting of hospital-acquired infections and calling for infection data to be made available to consumers.

The problems with existing monitoring arrangements prompted the recent ACSQHC study of healthcare-associated infections to recommend nationally-consistent approaches, including strengthened surveillance for:

- BSIs classified as being SAB, central-line associated in ICUs, and haemodialysis-access associated

- SSIs, including those linked to coronary artery bypass graft surgery, major-joint prosthesis insertion, and other procedures that have higher-than-expected SSI rates at the local level
- bacterial sepsis in the first week of life, including meningitis (Cruickshank and Ferguson 2008).

Some progress has been made in this regard. In December 2008, the Australian Health Ministers' Conference (AHMC) decided that all public hospitals will have to report two infection indicators — SAB BSIs and *Clostridium difficile* — on a nationally-consistent basis (ACSQHC, sub. 24). In November 2009, AHMC included SAB BSIs and *Clostridium difficile* in a national set of safety and quality indicators (DOHA, sub. DR 69, p. 9). Reporting of these two indicators is being facilitated by the ACSQHC, which is also considering other infection indicators at the request of the AHMC. The states and territories have implemented, or are in the process of implementing, the required surveillance and reporting arrangements.

Health Ministers also noted at their December 2008 meeting that hand hygiene is a key element in the prevention of hospital-acquired infections. They therefore supported a National Hand Hygiene Initiative, which commenced in early 2009 and is managed by Hand Hygiene Australia with oversight by the ACSQHC. The Ministers called for nationally-consistent measurement of hand hygiene compliance using approaches facilitated by the ACSQHC. The Royal Australasian College of Surgeons supported consistent reporting of hand hygiene and infection rates:

> The College has a longstanding interest in hospital-based infections, infection control, the use of antibiotics, approaches to hand hygiene and the impact of these on individual patient care. Substantial work over the past decade has again highlighted the importance of systemwide approaches to hand hygiene and its impact on key infections like MRSA bacteraemias and surgical-site infections. The College would certainly support the introduction of nationwide reporting on some of these key measures. To our knowledge, however, there is no current methodology for this at the individual state and territory level for public or private hospitals. (sub. 30, p. 3)

The Health Care Associated Infection Unit, Communicable Disease Control Directorate, Department of Health WA (sub. 38) noted that process indicators — such as hand-hygiene compliance rates, compliance with surgical antibiotic prophylaxis, influenza staff vaccination rates and central-line insertion and care protocols — have the advantage that they do not need to be adjusted for patient-risk factors.

States and territories will also have to report indicators for some hospital-acquired infections in public hospitals under the National Healthcare Agreement (NHA). The

Australian Government Department of Health and Ageing advised that a performance benchmark had been set under the NHA for SAB BSIs:

> Sound comparisons between the public and private sectors on the basis of hospital-acquired infections is necessary with a clear need to set benchmarks and identify best practice. One of the performance benchmarks adopted under the NHA is that the rate of *Staphylococcus aureus* (including MRSA) bacteraemia be no more than 2.0 per 10 000 occupied bed days for acute care public hospitals by 2011-12 in each state and territory. (sub. 32, p. 21)

This has strengthened the acceptance by jurisdictions of nationally-consistent definitions for SAB BSIs under the abovementioned AHMC decision.

While the abovementioned developments are welcome, more actions will be needed to establish a comprehensive and nationally-consistent approach to infection monitoring. For example, private hospitals are not subject to the recent AHMC decision and NHA reporting requirements. The ACSQHC also noted the need for further reforms and recommended:

- the eventual incorporation of private hospitals in national health care reporting, such as those currently managed through National Health Information Agreements
- the development of national hospital peer groupings which include and classify private hospitals
- the national development of standard measures of safety and quality which are applied across all Australian hospitals
- the promotion of routine review of safety and quality indicators by all hospitals in Australia. (sub. 24, p. 10)

The Productivity Commission supports the above recommendations made by the ACSQHC, which was established to lead and coordinate national improvements in the safety and quality of health care.

FINDING 6.2

Foreshadowed developments, such as performance reporting under the National Healthcare Agreement, will move Australia closer to a robust nationally-consistent data collection on hospital-acquired infections. However, more actions will be required to enable meaningful infection-rate comparisons between public and private hospitals. An important step in this regard would be to include private hospitals in national reporting arrangements. The Australian Commission on Safety and Quality in Health Care is leading and coordinating initiatives that should improve the feasibility of future comparisons.

7 Other partial indicators

Key points

- The complexity of hospital services means that indicators additional to those reported in chapters 5 and 6 are necessary to compare the performance of public and private hospital systems. In broad terms, these indicators cover *partial productivity*, *access* and *quality and patient safety*.
- The Commission observed a paucity of reliable published data with which to compare the hospital sectors.
- Best available partial productivity data suggest that private hospitals operate leaner staffing levels and have shorter average lengths of stay per episode of care.
- The shorter average lengths of stay are due to:
  - private hospitals (on average) having relatively shorter lengths of stay for the same surgical procedures
  - private hospitals undertaking relatively more surgical procedures.
- In terms of access, the number of accident and emergency department visits grew from 5.8 to 7.1 million between 2002-03 and 2007-08. The proportion of patients being seen within their triage benchmarks is reported to have improved. However, there are some questions about the veracity of available data.
- More people are on public hospital elective surgery waiting lists and they are waiting longer to be admitted into public hospitals than in 2002-03.
  - Yet, public hospitals were observed to be meeting their hospital waiting time targets. Data manipulation is alleged to have occurred with elective surgery waiting lists in Victoria, and data need to be collected on a consistent basis across Australia.
- Bed occupancy rates are a more comparable measure of timely access to hospitals. Public hospitals have average bed occupancy rates that are above or near the levels where regular bed shortages can occur.
- The reporting of national quality and patient safety indicators is still at a formative stage, and few data can provide a comparison between public and private hospitals.
- The best available data on the percentage of hospital separations that involve an adverse event have many shortcomings, but suggest a lower incidence of adverse events in private hospitals.

The terms of reference ask the Commission to examine and report on the relative performance of the public and private hospital systems. In doing so, the Commission is to consider other performance indicators, including the ability of such indicators to inform comparisons of hospital performance and efficiency, and to propose any developments that would improve the feasibility of future comparisons.

Many partial indicators of hospital performance have been reported in other publications (for example, DOHA 2009f; SCRGSP 2009; AIHW 2008c, 2009a). The Commission has included such indicators to provide as complete a picture as possible of the performance and efficiency of the public and private hospital systems, and the accessibility and quality of care each system provides. Some well-established indicators of the performance of the public hospital system, such as waiting times, are not available for the private sector. The Commission nevertheless considers that such indicators provide useful information on the performance of the public hospital system.

Chapters 5 and 6 reported on average costs per separation and hospital-acquired infection rates. To identify additional indicators of system performance, the Commission reviewed a number of existing performance indicator frameworks, as well as frameworks under development such as the proposed National Healthcare Agreement indicator set. The partial indicators covered in this chapter (as well as those reported earlier) are summarised in box 7.1.

In choosing the indicators, the Commission was guided by three overarching principles. The indicators should be:

- outcome and output based — they should reflect how hospitals are improving health outcomes, or if that is not possible, how well they are providing services
- hospital-wide — they should reveal the overall performance of hospitals and hospital sectors rather than specific aspects of clinical care
- based on the best available data — except for those data that are manifestly inadequate, the best available data should be reported and their known deficiencies documented.

There are four implications that arise from the choice of indicators and data. First, a number of input or process-oriented indicators are not reported here, even though they are found in other frameworks. For example, indicators on the workforce sustainability of hospitals are excluded because their interpretation is ambiguous. A high proportion of an older nursing workforce, for example, may indicate insufficient recruitment of junior nurses, or it can indicate a more effective, experienced workforce.

Box 7.1 Summary of partial indicators

- Costs (chapter 5)
  - cost per casemix-adjusted separation
  - average cost of individual DRGs
- Productivity
  - labour productivity
  - bed productivity
  - drug, medical and surgical supplies productivity
  - relative stay index
- Access to hospital services
  - emergency department waiting times
  - elective surgery waiting lists and times
  - occupancy rates
  - private hospital insurance costs
  - rates of separation for elective surgery
- Quality and patient safety
  - hospital-acquired infections (chapter 6)
  - accreditation of hospitals and hospital beds
  - unplanned readmissions and returns
  - adverse events
  - obstetric indicators.

Second, much of the data presented in this chapter are publicly available and have well-known deficiencies, such as the data published by the Australian Council on Healthcare Standards (ACHS). The Commission has also made a number of suggestions that would improve the availability and comparability of data in the future.

Third, as with average costs and hospital-acquired infection rates, each of the indicators in box 7.1 are partial measures of hospital performance. This means that it is potentially misleading to interpret the results of any one indicator without regard to others.

Finally, most of the partial indicators presented in this chapter are drawn from published sources and are averages for each sector. The Australian Health Service Alliance (AHSA) cautioned that:

> While overall sector information is useful when comprehensive and robust, such aggregate information may conceal the existence of a small number of hospitals with particularly low quality. (sub. DR53, p. 6)

As noted in chapters 2, 3 and 4, public hospitals differ considerably from each other in size and location and private hospitals have a range of operational motives. These differences are not captured in the partial indicators presented in this chapter.

7.1 Productivity

An important policy objective is whether hospitals are making economical use of their resources. Wasted resources can mean a lost opportunity to improve health outcomes. A measure of the efficiency of resource use is technical efficiency (chapter 1). A hospital is said to be technically efficient if, in the provision of a service, it is not feasible to reduce any input without also decreasing the service and without increasing any other input.

The preferred measure of technical efficiency is total factor productivity (TFP). TFP indicates how effectively hospitals are able to transform all of their inputs (labour, capital, and pharmaceutical, medical and surgical supplies) to provide all of their services (inpatient and outpatient services and emergency department visits).

TFP, however, is difficult to measure for hospitals. This is because some of the information needed to calculate TFP, such as measures of capital and revenue, are not available for hospitals. Instead, this section reports four partial measures of productivity:

- labour productivity
- bed productivity
- drug, medical and surgical supplies productivity
- relative stay index.

Care must be exercised when interpreting these measures. First, each of the partial productivity measures need to be read together. Second, except for casemix adjustment, none of them account for a range of factors that can affect a hospital's performance, such as:

- the range of non-inpatient services hospitals provide (such as accident and emergency departments)
- the patient risks hospitals manage
- other factors outside the control of hospitals.

Labour productivity

Labour productivity is a measure of the extent to which non-medical staff (all hospital staff except doctors and surgeons) contribute to a hospital's services.[1] Labour costs are a significant component of hospital costs, and hospitals with high labour productivity are likely to be more technically efficient in their use of labour. Two measures of labour productivity of inpatient services were used:

- patient days per non-medical staff — defined as the number of days for which a hospital provides lodging to patients divided by the number of non-medical staff
- casemix-adjusted separations per non-medical staff — defined as casemix-adjusted separations divided by the number of non-medical staff.

It is difficult to draw accurate comparisons of labour productivity between public and private hospitals because, as noted earlier, no account was made for teaching and research functions or for the non-inpatient services provided by many public hospitals. Valid comparisons can be made over time, however. These trends suggest that both patient days per non-medical staff member and separations per non-medical staff member have been declining in public hospitals and increasing for private hospitals between 2002-03 and 2007-08 (table 7.1).

There are three other limitations to this indicator. First, hospital establishment data do not count the number of doctors and surgeons exercising their rights of private practice in private and public hospitals (AIHW 2009a; ABS 2008f). As a result, to improve comparability between sectors, private practice and salaried doctors and surgeons were excluded from the count of staff for both private and public hospitals.[2]

Second, high labour productivity may not always be desirable. Catholic Health Australia said that measuring the numbers of separations per doctor or nurse:

> … could send signals that use of fewer than clinically appropriate numbers of clinical staff is to be encouraged. (sub. 20, p. 13)

A relatively high ratio of medical and nursing staff to patients may provide a higher level of personal care to patients at levels that are clinically appropriate.

---

1 The reasons for excluding medical staff from this calculation of labour productivity are detailed below.

2 Despite this general exclusion, it was not possible to fully exclude from the data the few salaried medical officers employed in private hospitals. Their inclusion does not materially affect the results.

Finally, labour productivity estimates include psychiatric hospitals. Data for private acute and psychiatric hospitals were not available separately, so for comparability, psychiatric hospitals were included in the public hospital dataset.

Table 7.1 **Labour productivity, 2002-03 and 2007-08[a]**

	Patient days per non-medical staff member		*Casemix-adjusted separations per non-medical staff member[b]*	
	2002-03	*2007-08[c]*	*2002-03*	*2007-08[c]*
Public hospitals				
NSW	92	89	22	23
Vic	91	78	24	23
Qld	94	77	23	22
SA	106	96	26	24
WA	86	79	21	22
Tas	100	87	24	23
NT	105	103	26	25
ACT	84	82	23	25
Australia	93	84	23	22
Private hospitals				
NSW	154	149	49	55
Vic	145	151	44	52
Qld	149	159	44	53
SA	150	150	49	56
WA	145	138	42	40
Tas, NT and ACT[d]	138	156	np	np
Australia	148	151	44	52

[a] ABS data for private hospitals do not exclude psychiatric hospitals. For comparability, psychiatric hospitals have been included in both hospital samples. [b]Excludes newborns with no qualified days, hospital boarders and posthumous organ donors. [c]2006-07 data for private hospitals. Includes a small number of salaried medical officers. [d]Data on private hospitals in Tasmania, the Northern Territory and the ACT are aggregated to protect the confidentiality of the small number of hospitals in each of these jurisdictions. **np** Not published.

Source: AIHW (2004, 2009a); ABS (*Private Hospitals, Australia*, Cat. no. 4390.0); Productivity Commission estimates.

Bed productivity

Capital productivity is a measure of the extent to which a hospital's capital stock (buildings, plant and equipment) contributes to the provision of hospital services. There are various difficulties associated with quantifying the capital stock of hospitals in dollar terms (chapter 5), and so the number of licensed or available beds is used here as a proxy. Two measures of bed productivity were used:

- patient days per bed — the number of days for which a hospital provides lodging to patients divided by the number of licensed or available beds

- casemix-adjusted separations per bed — casemix-adjusted separations divided by the number of licensed or available beds.

Hospitals with high rates of bed productivity are likely to be more technically efficient in their use of capital.

Hospital bed productivity measures are relatively more comparable measures of inpatient services than labour productivity. This is because beds, unlike labour, are used exclusively for inpatient services. Public hospitals recorded more patient days per bed (316) than private hospitals (279) in 2007-08, although there was considerable variability for both public and private hospitals in each state and territory (table 7.2). Nationally, the rate of bed utilisation declined slightly for public hospitals and increased for private hospitals between 2002-03 and 2007-08. Separations per bed were similar between public and private hospitals in 2002-03, but by 2007-08, private hospital bed productivity had grown relatively larger.

Table 7.2 **Bed productivity, 2002-03 and 2007-08**

	Patient-days per bed		*Casemix-adjusted separations per bed*[a]	
	2002-03	*2007-08*	*2002-03*	*2007-08*
Public hospitals				
NSW	337	311	79	79
Vic	357	351	93	102
Qld	295	281	73	79
SA	330	324	81	81
WA	301	302	73	83
Tas	336	302	82	78
NT	362	423[b]	90	104
ACT	322	326	88	98
Australia	330	316	81	85
Private hospitals				
NSW	264	308	86	115
Vic	281	279	87	95
Qld	280	298	83	101
SA	282	302	92	115
WA	260	215	79	79
Tas, NT and ACT[c]	np	199	np	np
Australia	264	279	82	99

[a] Excludes newborns with no qualified days, hospital boarders and posthumous organ donors. [b] Patient days per bed may exceed 365 since beds may have more than one same-day patient. [c] Data on private hospitals in Tasmania, the Northern Territory and the ACT are aggregated to protect the confidentiality of the small number of hospitals in each of these jurisdictions. **np** Not published.

Source: AIHW (2004, 2009a); ABS (*Private Hospitals, Australia*, Cat. no. 4390.0); Productivity Commission estimates.

The use of beds as a proxy for capital costs is not without its limitations. While bed productivity is acceptable for comparing across hospitals of similar peer groups in a given year, it is less appropriate for comparing across different types of hospitals (as beds do not reflect differences in specialisations) or for considering trends over time (as it does not capture the gradual uptake of new technologies).

Another limitation of the bed productivity indicator is that high bed productivity (utilisation) is not unambiguously desirable. Some spare capacity is necessary to manage the unpredictable workload associated with emergency admissions and to provide timely access to elective surgery (see section 7.2).

Drug, medical and surgical supplies productivity

Drug, medical and surgical supplies represent a significant component of hospital operating costs. The Steering Committee for the Review of Government Service Provision (SCRGSP 2009) reported that about 15 per cent of public hospital recurrent (non-capital related) expenditure was attributable to drug, medical and surgical supplies. Hospitals with high productivity in the use of drug, medical and surgical supplies are likely to be more technically efficient in that area.

Two measures of drug, medical and surgical supplies productivity are used in this chapter:

- patient days per $1000 of expenditure on drug, medical and surgical supplies — the number of days for which a hospital provides lodging to patients divided by $1000 of constant price expenditure on drug, medical and surgical supplies
- casemix-adjusted separations per $1000 of expenditure on drug, medical and surgical supplies — casemix-adjusted separations divided by $1000 of constant price expenditure on drug, medical and surgical supplies.

Drug, medical and surgical supply productivity is not easily comparable between public and private hospitals due to the different prices paid by the sectors for their supplies. A given sector's productivity, however, is more comparable over time. Both the patient-days and separations per $1000 spent on drug, medical and surgical supplies declined for both public and private hospitals (table 7.3). Given that prices are held constant, the 'productivity decline' represents an increase in the intensity of the use of drug, medical and surgical supplies in the delivery of services.

To the extent that public hospitals pay less for their drug, medical and surgical supplies than private hospitals, actual public hospital productivity will be lower than indicated by the rates reported in table 7.3.

Table 7.3 **Drug, medical and surgical supplies productivity, 2002-03 and 2007-08[a]**

	Patient-days per $1000 drug, medical and surgical supplies		*Separations per $1000 drug, medical and surgical supplies[b]*	
	2002-03	*2007-08[c]*	*2002-03*	*2007-08[c]*
Public hospitals				
NSW	6.4	4.0	1.4	0.9
Vic	7.3	3.9	2.0	1.2
Qld	6.5	3.4	1.6	0.9
SA	10.0	5.7	2.4	1.3
WA	6.8	4.2	1.7	1.2
Tas	6.7	3.2	1.5	0.8
NT	6.6	5.4	2.2	1.9
ACT	5.8	4.0	1.7	1.2
Australia	6.9	4.0	1.7	1.1
Private hospitals				
NSW	4.6	3.4	1.4	1.2
Vic	5.7	4.0	1.8	1.4
Qld	6.2	4.2	1.8	1.4
SA	5.5	3.9	1.7	1.3
WA	6.0	3.5	2.0	1.2
Tas, NT and ACT[d]	2.0	4.0	0.7	1.5
Australia	5.3	3.8	1.7	1.3

[a] Deflator is constructed from drug (imported and domestic) indices, and medical and surgical supply (imported and domestic) indices. ABS data for private hospitals do not exclude psychiatric hospitals. For comparability, psychiatric hospitals have been included in both hospital samples.[b] Excludes newborns with no qualified days, hospital boarders and posthumous organ donors. [c] 2006-07 data for private hospitals. [d] Data on private hospitals in Tasmania, the Northern Territory and the ACT are aggregated to protect the confidentiality of the small number of hospitals in each of these jurisdictions.

Source: AIHW (2004, 2009a); ABS (*Private Hospitals, Australia*, Cat. no. 4390.0); Productivity Commission estimates.

Relative stay index

Hospital length of stay is sometimes used as a measure of hospital efficiency. It is an indirect measure of technical efficiency because hospitals that have shorter lengths of stay for a patient are presumed to be able to spread the total cost of fixed overheads and capital assets across a greater number of patients.

The average length of stay (ALOS) is a useful indicator in this regard, and is commonly used to compare hospital performance for individual procedures (AIHW 2009a). However, it is a poor indicator when comparing the performance of hospitals across all of their inpatient activity. This is because a hospital's reported ALOS does not adjust for its composition of services.

A more appropriate measure of a hospital's ALOS is its relative stay index (RSI). The RSI is defined as the actual number of acute care patient days divided by the *expected* number of acute care patient days, adjusted for casemix. RSI differs from ALOS in two respects:

- the length of stay is standardised using a reference composition of procedures (in much the same way as age standardisation)
- each DRG is adjusted for its relative cost weight (AIHW 2009a; SCRGSP 2009).

Public hospitals exhibited relatively shorter lengths of stay than private hospitals for medical DRGs (with an RSI of 0.94 compared to 1.20) in 2007-08 (table 7.4). Private hospitals exhibited shorter lengths of stay for surgical DRGs than public hospitals (0.98 compared to 1.03) in 2007-08.

Table 7.4 **Relative stay index, public and private hospitals, by DRG procedure partitions, 2002-03 and 2007-08[a]**

	Medical		*Surgical*		*Other*	
	2002-03	*2007-08*	*2002-03*	*2007-08*	*2002-03*	*2007-08*
Public hospitals						
NSW	1.03	1.01	1.08	1.05	1.19	1.16
Vic	0.91	0.86	0.99	1.01	1.00	1.01
Qld	0.92	0.89	0.99	0.98	1.04	1.09
SA	0.94	0.97	1.01	1.04	1.00	1.03
WA	1.03	0.97	1.04	1.04	1.00	0.99
Tas	1.01	0.95	1.07	1.02	1.09	1.10
NT	np	1.08	np	1.44	np	1.4
ACT	np	0.88	1.07	0.94	1.10	0.91
Australia	0.96	0.94	1.03	1.03	1.07	1.07
Private hospitals						
NSW	1.26	1.31	0.93	0.96	0.87	0.96
Vic	1.13	1.17	0.97	0.99	0.95	0.97
Qld	1.16	1.18	0.98	0.95	0.98	0.98
SA	1.13	1.16	0.96	0.97	0.91	0.97
WA	1.19	1.18	1.04	1.07	0.98	0.98
Tas, NT and ACT[b]	np	np	np	np	np	np
Australia	1.17	1.2	0.97	0.98	0.93	0.97

[a] Under the direct standardisation method, RSI is calculated by multiplying the ALOS for each sub-group of hospital by total number of separations undertaken by all hospitals, divided by the total patient days for all hospitals. [b] Owing to commercial-in-confidence restrictions on ABS data, it was not possible to estimate the RSI of private hospitals in Tasmania, the ACT and the Northern Territory, though their contributions are included in the Australian total. **np** Not published.

Source: AIHW (2004, 2009a).

It follows that the relatively low ALOS observed for private hospitals is due to a combination of their lower RSI for surgical and other DRGs (compared to public hospitals), and their tendency to undertake relatively more separations in the surgical and other DRG partitions than public hospitals (chapter 4).

Even though the RSI represents an improvement on simply reporting hospital-level ALOS, both indicators have their limits. Neither reports the actual resources used in the delivery of an episode of care — TFP is a better measure in this regard. Two hospitals, for example, that exhibit the same RSI or ALOS might still differ in technical efficiency if one hospital employs more staff and other resources than the other.

Labour intensity of hospitals

Labour intensity is a measure of how many staffing resources hospitals employ relative to other inputs. Labour intensity is a useful descriptor of the way a hospital manages its workload. A high (or low) labour intensity is not necessarily desirable, but it can illustrate some of the drivers behind the productivity measures described above.

Public hospitals employed more allied health workers, nursing and other personal care staff per bed than did private hospitals over the period 2002-03 to 2007-08 (table 7.5). This is understandable, given that public hospitals are more likely to provide accident and emergency departments and outpatient clinics than private hospitals.

The number of administration and clerical workers per bed is likely to be more comparable, although this depends on the extent to which clerical and administration staff are part of a hospital's 'overheads' and do not vary substantially with its activities. In broad terms, public hospitals employed twice as many administration and clerical staff than did private hospitals over the period 2002-03 to 2007-08 (table 7.5). The administration and clerical staff reported here do not include off-campus staff (such as head-office staff), and no account has been made of differences in the provision of emergency departments and outpatient services.

Public hospitals reduced the number of allied health, nursing and other personal care workers per bed between 2002-03 and 2007-08, while both hospital sectors increased the number of administration and clerical staff per bed during the same period.

Table 7.5 **Labour intensity of public and private hospitals, 2002-03 and 2007-08[a]**

	Allied health, nursing and other care workers per bed[b]		*Administration and clerical staff per bed*	
	2002-03	*2007-08[c]*	*2002-03*	*2007-08[c]*
Public hospitals				
NSW	3	2.93	0.65	0.56
Vic	3.2	3.63	0.73	0.85
Qld	2.63	3.05	0.5	0.58
SA	2.53	2.77	0.59	0.62
WA	2.84	3.09	0.65	0.75
Tas	2.87	2.93	0.47	0.52
NT	2.81	3.42	0.63	0.68
ACT	3.05	3.26	0.78	0.72
Australia	3.05	2.84	0.6	0.65
Private hospitals				
NSW	1.53	1.67	0.22	0.3
Vic	1.72	1.67	0.23	0.31
Qld	1.55	1.46	0.34	0.35
SA	1.59	1.43	0.28	0.27
WA	1.6	1.79	0.26	0.34
Tas, NT and ACT[d]	np	1.08	0.25	0.21
Australia	1.6	1.58	0.26	0.31

[a] All staff measured in full-time equivalents. [b] Includes a small number of salaried medical officers for private hospitals because these could not be separated from the data. [c] 2006-07 data for private hospitals. [d] Data on private hospitals in Tasmania, the Northern Territory and the ACT are aggregated to protect the confidentiality of the small number of hospitals in each of these jurisdictions. **np** Not published.

Source: AIHW (2004, 2009a); ABS (*Private Hospitals, Australia*, Cat. no. 4390.0); Productivity Commission estimates.

FINDING 7.1

Private hospitals appear to operate relatively leaner staffing levels than public hospitals, although it is not clear how much of this difference can be explained by the higher provision of emergency department and outpatient clinic services by public hospitals.

FINDING 7.2

Private hospitals exhibit shorter lengths of stay than public hospitals. This is due to private hospitals exhibiting relatively shorter lengths of stay for surgical procedures and undertaking relatively more surgical procedures than public hospitals.

7.2 Access to hospital services

The timeliness of access to hospital care can have a profound influence on clinical outcomes. As the Victorian Auditor-General remarked:

> Timely access to hospital care is important. For patients requiring emergency care or elective surgery, the time taken to receive services can significantly affect clinical outcomes. (Victorian Auditor-General 2009, p. 1)

The ability of patients to access medical and surgical services is thus an important policy objective of governments and an important motivator for private hospital insurance.

Under the National Healthcare Agreement (NHA), state and territory governments have agreed to provide free public hospital services based on:

- clinical need within a clinically appropriate time period
- equitable access regardless of a patient's geographic location.

The NHA, like the Australian Health Care Agreements which preceded it, requires states and territories to collect data on waiting times for emergency treatment and elective surgery in public hospitals. These access measures are widely available and well-established indicators of public hospital performance.

In contrast to the regular reporting of public sector waiting times, few measures of timely access to private hospitals are available. The Commission has only been able to directly compare the accessibility of care between the public and private systems for a small number of indicators relating to equitable access to elective surgery.

Timely access to emergency treatment

Emergency medicine is concerned with addressing the injury or illness that poses an immediate risk to a patient's life or long-term health. The Australian Triage Scale recognises that the most urgent (resuscitation) patients need to be seen immediately and the least urgent emergency patients need to be seen within two hours of presentation to a hospital emergency department (ACEM 2000).

Public hospitals

Public hospitals (including privately-owned hospitals that provide public hospital services) are required by each state and territory health department to collect and report data on the number of persons presenting to emergency departments, the assignment of clinical urgency, the time at which the person was seen by a medical officer, and the outcomes of the emergency care.

Data are reported to the Australian Government Department of Health and Ageing (DOHA) and the Australian Institute of Health and Welfare (AIHW) under the National Non-Admitted Emergency Department Care Data Collection and are widely published (AIHW 2009a; SCRGSP 2009; DOHA 2009f).

Between 2002-03 and 2007-08, the number of recorded visits to public hospital accident and emergency departments grew from 5.8 million to 7.1 million, or at about 4.1 per cent per year. In most states, the proportion of patients that were seen within their prescribed benchmark times improved in recent years (table 7.6). The greatest improvements were observed for urgent and semi-urgent cases. For example, the proportion of semi-urgent patients that were seen within their benchmark times increased from 61 to 66 per cent between 2002-03 and 2007-08. Public hospitals in the ACT and the Northern Territory, however, experienced significant declines in the proportion of non-resuscitation patients that were seen within their benchmark times (AIHW 2009a).

Care needs to be exercised when interpreting waiting-time data for emergency departments. There appears to be a significant variation between hospitals in how waiting times are measured, including the assignment of clinical urgency categories (SCRGSP 2009).

Potentially more serious, however, is the suggestion that data manipulation has occurred in at least one and possibly more Victorian public hospitals. The Victorian Auditor-General found that the quality of Victorian emergency department waiting-time data had ‘fundamental flaws both with data accuracy and the rigour of data capture processes’ (Victorian Auditor-General 2009, p. v). In particular:

> … hospitals inconsistently interpreted reporting rules, data capture methods were susceptible to error, and the accuracy of some data was impossible to check. This means incorrect data can go undetected. In one hospital, data manipulation had occurred. (Victorian Auditor-General 2009, p. 3)

Dr Stephen Parnis, an emergency physician at St Vincent’s Hospital and vice president of the Victorian Branch of the Australian Medical Association (AMA), in giving evidence to a Victorian parliamentary inquiry, expressed doubts over the credibility that all Victorian resuscitation patients were seen on time (Medew 2009).

Table 7.6 **Public hospital emergency department waiting times, 2002-03 and 2007-08**

	NSW	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*	*Aust*
Number of accident and emergency department occasions of service (thousands of visits)									
2002-03	1 982	1 261	1 223	472	571	97	94	96	5 796
2007-08	2 418	1 523	1 471	544	778	143	125	98	7101
Rate of change	4.1	3.8	3.8	3.8	-0.9	8.1	5.9	0.5	4.1
Proportion of resuscitation patients seen on time									
2002-03	100	100	99	99	94	92	100	100	99
2007-08	100	100	98	100	99	99	100	100	100
Rate of change	0.0	0.0	-0.3	0.3	1.0	1.6	0.0	0.1	0.2
Proportion of emergency patients seen on time									
2002-03	77	84	73	66	73	55	60	82	75
2007-08	81	79	69	72	69	74	59	81	76
Rate of change	1.1	-1.2	-1.0	1.9	-1.2	6.1	-0.5	-0.3	0.2
Proportion of urgent patients seen on time									
2002-03	57	76	55	47	64	61	64	74	61
2007-08	69	71	56	54	56	54	47	52	63
Rate of change	3.7	-1.4	0.3	2.9	-2.8	-2.4	-6.0	-6.8	0.7
Proportion of semi-urgent patients seen on time									
2002-03	62	65	55	49	68	60	59	67	61
2007-08	75	65	61	60	59	58	47	51	66
Rate of change	3.7	-0.1	1.9	4.0	-2.9	-0.5	-4.3	-5.4	1.6
Proportion of non-urgent patients seen on time									
2002-03	87	86	80	85	87	90	88	79	85
2007-08	90	86	87	80	86	86	86	78	87
Rate of change	0.8	0.1	1.7	-1.1	-0.3	-0.9	-0.4	-0.3	0.4
Proportion of all patients seen on time									
2002-03	65	73	60	53	73	64	65	74	66
2007-08	76	71	63	61	61	60	52	58	69
Rate of change	3.1	-0.5	1.1	3.0	-3.6	-1.4	-4.5	-4.8	0.9

Source: AIHW (2004, 2009a); Productivity Commission estimates.

Private hospitals

A number of privately operated hospitals provide emergency departments, with some serving public patients. The Australasian College for Emergency Medicine (ACEM, sub. 14) argued that waiting times at privately-operated emergency departments were generally less than their public hospital counterparts. According to statistics supplied by the ACEM for three private hospitals in different states (one of which was contracted to provide public hospital emergency department services) in 2007-08:

- 96 per cent of resuscitation patients were seen on time (though this was based on a very small sample of patients)
- 79 per cent of emergency patients were seen on time
- 70 per cent of urgent patients were seen on time
- 72 per cent of semi-urgent patients were seen on time (though there was a large range, 46 to 99 per cent)
- 93 per cent of non-urgent patients were seen on time (sub. 14; pers. comm.).[3]

The ACEM (sub. 14) claimed that some of the main reasons why private hospital emergency departments were able to achieve shorter waiting times were because they had:

- relatively more senior staff in decision-making positions
- incentive-based payments that are aligned with patient throughput
- efficient department sizes
- processes and systems designed to reduce waiting times and improve efficiency.

Timely access to elective surgery

Elective surgery is any form of surgery that a patient's doctor or health professional considers to be necessary but which can be delayed by at least 24 hours (DOHA 2009f).

The two hospital systems have different approaches to providing access to elective surgery. In the public hospital system, the decision to grant a patient access is made by the hospital, reflecting its judgement about the patient's clinical needs as well as its resourcing and performance targets. The decision to access private hospital services, by comparison, is usually made by the patient and their consulting physician. The decision reflects the patient's willingness to pay for the expected benefits of the hospital care, where there is a know out-of-pocket cost.

The AHSA observed that these different approaches have implications for comparing timely access between public and private hospitals:

> [Timely access] is an area where one can anticipate the private sector will produce better results than the public sector. This is because in the private sector funding is uncapped which means there is an incentive and additional resources to facilitate the treatment of additional patients. In the public sector funding and throughput are capped

[3] Pers. comm., Dr Yusuf Nagree, Chair Private Practice Committee, Australasian College for Emergency Medicine, 28 August and 14 September 2009.

> by finite levels of funding and this will reduce access to public hospitals. The comparison and anticipated differences are thus primarily driven not by the hospitals but the differing funding conditions in the two sectors. (sub. 1, p. 8)

Despite uncapped funding to the private sector, some patients may experience difficulties gaining access to private hospitals. The Doctors Reform Society of Australia (sub. DR50) referred to a survey conducted by the Victorian Branch of the AMA. The survey found that private hospitals sometimes refuse to admit patients, with those aged 75 and over most commonly refused admission (AMA Victoria 2001).

Many study participants noted that the need to divert resources to emergencies can interrupt and constrain the delivery of elective surgery. In contrast, the NSW Health Surgical Services Taskforce submitted that:

> … emergency surgical admissions [are] entirely predictable and could be managed more effectively with a planned approach thereby minimising disruption to elective surgical services.(sub. DR43, p. 1)

The Commission examined two measures of timely access to elective surgery:

- public hospital waiting times
- occupancy rates.

Consideration of waiting times was limited to the public sector because private hospital operators do not maintain elective surgery waiting list data. Even though hospital operators maintain detailed morbidity data for each admitted patient (which include a record of the date of admission), such data do not typically record the date of the consultation during which it was decided to admit the patient, so it is not possible to calculate the time taken to receive treatment at a private hospital.

Public hospital waiting times

Public hospitals are required by each state and territory health department to collect data on the number of patients on their waiting lists, the clinical categories assigned to those patients, and the time it has taken from listing to admission for elective surgery. State and territory health departments routinely publish statistics about the performance of public hospitals against performance targets (for example, NSW Department of Health nd; DHS (Victoria) 2009).

Elective surgery waiting times data are collected under the National Elective Surgery Waiting Times Data Collection, and are widely published (AIHW 2008e; SCRGSP 2009; DOHA 2009f). Three elective surgery waiting list indicators are presented:

- net growth (change) in the number of people on waiting lists
- average number of days waited for an admission
- proportion of people being admitted from a waiting list within the benchmark times, by clinical urgency.

The number of people seeking elective surgery grew by 4.8 per cent per year between 2002-03 and 2007-08, with particularly significant growth in 2006-07 and 2007-08 (table 7.7). In contrast, the number of elective surgery admissions only grew by 1.8 per cent per year. After allowing for 'removals', there was a net increase in the number of people waiting for elective surgery between 2002-03 and 2007-08.

The reasons why people were removed from a waiting list is also instructive. The number of people who were taken off the waiting list because they were admitted as an emergency patient, sought treatment outside the public hospital system or could not be contacted (or were presumed to have died) grew *more quickly* than the number of patients being admitted to public hospitals for elective surgery (table 7.7).

Table 7.7 **Additions and removals from public hospital elective surgery waiting lists, 2002-03 to 2007-08**

	2002-03	*2003-04*	*2004-05*	*2005-06*	*2006-07*	*2007-08*	*Rate of change*
	no.	*no.*	*no.*	*no.*	*no.*	*no.*	*%*
Total additions	586 744	608 680	621 015	638 904	734 715	740 952	4.8
Total removals	601 972	618 180	645 340	657 401	650 973	661 275	1.9
Elective admission	517 503	528 949	549 746	556 953	556 770	565 501	1.8
Emergency admission	3 541	3 985	6 757	6 154	5 909	5 650	9.8
Not contactable/died	7 142	6 832	8 488	9 792	9 036	9 514	5.9
Treated elsewhere	14 217	15 842	22 537	26 565	21 015	22 520	9.6
Other removals	59 569	62 572	57 812	57 937	58 243	58 090	-0.5
Net change to list	-15 228	-9 500	-24 325	-18 497	83 742	79 677	..

.. Not applicable

Source: AIHW (2004, 2005, 2006, 2007a, 2008b, 2009a); Productivity Commission estimates.

The second indicator reports how long people waited before being admitted for elective surgery. The average number of days waited between 2002-03 and 2007-08 increased from 28 to 34 days for the 50th percentile patient and from 197 days to

235 days for the 90th percentile patient (table 7.8). The proportion of admitted patients that had to wait longer than a year declined from 4 per cent to 3 per cent, though it increased in South Australia, the Northern Territory and the ACT (AIHW 2004, 2009a). Study participants suggested that policy decisions to focus efforts on reducing the number of people waiting longer than a year may have led to the observed increases in average waiting times.

Table 7.8 **Elective surgery waiting times, public hospitals, 2002-03 and 2007-08**

	NSW	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*	*Aust*
Days waited at 50th percentile[a]									
2002-03	29	28	21	34	27	42	45	48	28
2007-08	39	33	27	42	30	36	43	72	34
Average growth rate[b]	6.1	3.3	5.2	4.3	2.1	-3.0	-0.9	8.4	4.0
Days waited at 90th percentile[a]									
2002-03	227	197	113	181	207	389	305	300	197
2007-08	278	221	137	208	206	369	337	372	235
Average growth rate[b]	4.1	2.3	3.9	2.8	-0.1	-1.1	2.0	4.4	3.6
Percentage waited more than 365 days									
2002-03	4.2	4.2	2.6	3.0	3.9	10.9	7.0	7.1	4.0
2007-08	1.8	3.6	2.3	3.9	3.0	10.1	8.6	10.3	3.0
Average growth rate[b]	-15.6	-3.0	-2.4	5.4	-5.1	-1.5	4.2	7.7	-5.6

[a] Average wait in days. [b] Average annual rate of growth between 2002-03 and 2007-08.

Source: AIHW (2004, 2005, 2006, 2007a, 2008b, 2009a); Productivity Commission estimates.

The length of waiting lists, however, does not provide an indication of how long a patient actually waited for elective surgery. Waiting times do not take into account the time waited between the referral to the surgeon and the appointment with the surgeon, or the time between the appointment and being placed on the waiting list (AIHW 2008e; Victorian Auditor-General 2009).

The third indicator is a measure of how well hospitals met their respective targets to reduce waiting lists for each of three clinical urgency categories. The three generally accepted urgency categories for elective surgery are:

- category 1 (urgent) — admission is desirable within 30 days
- category 2 (semi-urgent) — admission is desirable within 90 days
- category 3 (non-urgent) — admission at some time in the future is acceptable.

There is no national benchmark for admitting non-urgent cases but the term ‘extended wait’ is used for patients waiting longer than 12 months and some jurisdictions do set targets for non-urgent cases (SCRGSP 2009).

The data suggest that the proportion of:

- patients still on waiting lists who have waited longer than their recommended times in all clinical urgency categories declined (improved) between 2002-03 and 2006-07 for all jurisdictions (except the Northern Territory which increased, and Queensland and Tasmania for which there was little change)
- patients admitted after having waited longer than their recommended times increased in most jurisdictions (except for NSW, for which this proportion decreased, and Tasmania, for which there was little change) (table 7.9).

Table 7.9 **Elective surgery waiting times by clinical category, public hospitals, 2002-03 and 2006-07[a]**

	NSW	*Vic*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*
Percentage of patients on waiting lists with extended waits								
2002-03								
Category 1 – 30 day	38.9[b]	–	2.3	17.0	39.2	52.0[c]	57.8	6.6
Category 2 – 90 day	40.2[b]	39.1	5.3	22.1	48.0	66.0[c]	52.0	55.8
Category 3	10.6[b]	27.1	38.2	18.3	29.7	31.0[c]	26.5	32.5
Total	22.7[b]	31.1	26.0	18.8	34.8	49.0[c]	35.8	41.5
2006-07								
Category 1 – 30 day	5.1	–	6.4	21.6	26.2	39.7	53.7	6.8
Category 2 – 90 day	28.9	34.0	20.5	16.8	46.2	64.8	51.7	54.0
Category 3	0.2	10.5	32.5	11.3	6.5	32.0	39.3	24.3
Total	8.5	20.5	25.6	13.5	21.9	48.8	45.9	38.7
Percentage of admitted patients with extended waits								
2002-03								
Category 1 – 30 day	38.9[b]	–	9.3	13.5	15.3	28.0[c]	14.5	8.8
Category 2 – 90 day	40.2[b]	20.5	11.8	15.6	23.5	43.0[c]	24.0	47.1
Category 3	10.6[b]	8.8	13.0	4.9	6.4	23.0[c]	14.6	18.1
Total	22.7[b]	12.4	11.1	10.1	13.6	32.0[c]	17.9	26.6
2006-07								
Category 1 – 30 day	12.9	–	13.2	22.5	28.8	25.0	19.2	7.2
Category 2 – 90 day	25.5	25.3	17.7	22.1	44.0	46.1	43.0	49.1
Category 3	4.4	8.5	11.7	9.5	24.3	22.6	39.9	30.4
Total	14.2	14.5	14.9	17.4	31.6	32.4	31.1	32.4

[a] Care must be taken when comparing between jurisdictions because of differences in how patients are assigned to clinical categories. [b] 2004-05 data for NSW. [c] 2005-06 data for Tasmania. – Nil or rounded to zero.

Source: SCRGSP (2005, 2009).

The AIHW commented that there 'is evidence of considerable variation in the assignment of clinical urgency categories' (AIHW 2008e, p. 3), and that the lack of comparability of clinical urgency categories means that indicators are 'not meaningful or comparable across jurisdictions' (AIHW 2008e, p. 4).

The Special Commission of Inquiry into Acute Care Services in NSW Public Hospitals (the Garling Review) was mindful of the quality of waiting list data, and recommended:

> NSW Health should institute an audit program of waiting lists kept for each hospital in NSW, conducted by staff who *are not associated with the relevant area health service or the hospital*. The audits should examine all paperwork that the hospital is required to maintain for the waiting lists including correspondence with referring doctor, and should include the auditing of any reclassification of patients' clinical urgency category. (emphasis added) (Garling Review 2008, Recommendation 82, p. 54)

Occupancy rates

The demand for hospital services — like fire, ambulance and police services — is highly variable and is often difficult to predict. In the presence of this unpredictability, a common strategy among these services is to ensure that the service has sufficient spare capacity. Even though increases in capacity utilisation are sometimes desirable from a productivity perspective, too high a capacity utilisation for a hospital can lead to problems with timeliness of access.

A measure of the capacity of a hospital to provide timely access is its occupancy rate, which is the number of patient days per bed divided by 365 times 100. An occupancy rate of 85 per cent has been suggested as an optimal target (for example, Baghurst, Place and Posnett 1999; Sprivulis et. al 2006). Forero and Hillman (2008) observed:

> There is clear evidence that occupancy rates in most urban public hospitals are greater than 85 per cent. When occupancy rates exceed 85 per cent, regular bed shortages and periodic bed crises are expected. If average bed occupancy rises to 90 per cent or more, access block crises are routinely expected. Spare bed capacity is essential for the effective management of emergency admissions and to have surge capacity. (Forero and Hillman 2008, p. 1)

Occupancy rates are greater than 85 per cent for public hospitals in most jurisdictions, although these have been declining in recent years. Conversely, relative occupancy rates for private hospitals were less than 85 per cent and have been increasing in recent years (table 7.10).

Table 7.10 **Occupancy rates, 2002-03 to 2007-08**[a]

	2002-03	*2003-04*	*2004-05*	*2005-06*	*2006-07*	*2007-08*
Public hospitals						
NSW	92	87	82	88	88	85
Vic	98	99	100	98	98	96
Qld	81	77	81	78	80	77
SA	83	82	81	83	82	83
WA	91	93	91	94	95	89
Tas	92	90	85	90	87	83
NT	88	94	92	94	91	89
ACT	99	103	108	118	118	116
Australia	90	88	87	89	89	87
Private hospitals[b]						
NSW	72	71	73	76	80	84
Vic	77	76	75	78	84	76
Qld	77	78	80	78	79	82
SA	71	73	74	65	67	59
WA	77	75	77	68	70	83
Tas, NT and ACT	np	np	np	53	53	55
Australia	72	71	72	74	76	76

a It is possible for a hospital to have an occupancy rate of more than 100 per cent because beds may have more than one same-day separation, and same-day separations are counted as having a length of stay of one day. **b** Includes private acute and psychiatric hospitals. **np** Not published.

Source: Productivity Commission estimates based on AIHW (2004, 2005, 2006, 2007a, 2008b, 2009a).

Care, however, needs to be exercised when interpreting occupancy rates. Hospitals that specialise in same-day separations will be observed to have higher rates since beds may have more than one same-day occupant, and same-day separations are usually counted as having a length of stay of one day. As a result, the occupancy rates for the private sector as a whole are likely to be relatively high. Similarly, occupancy rates are likely to be higher in jurisdictions that classify people receiving same-day treatments (such as chemotherapy and renal dialysis) as admitted patients rather than outpatients.[4]

Also, a benchmark of 85 per cent occupancy rate was applied for all hospitals, including those that did not operate emergency departments. Hospitals that have a more predictable patient flow can, arguably, operate to higher capacity levels. However, effective management of emergency surgical admissions can minimise

4 Victoria admits patients for treatments that other jurisdictions may administer as non-admitted (outpatient) services, such as chemotherapy and dialysis, and so a disproportionate share of Victorian separations may be categorised as admitted-patient services (Victorian Department of Health, pers. comm., 30 September 2009).

disruption to elective surgical services (NSW Health Surgical Services Taskforce, sub. DR43, p. 1).

Equitable access to elective surgery

The Commission examined two measures of equity of access to elective surgery:

- the affordability of private hospital insurance
- elective surgery separation rates of public and private hospitals.

Affordability of private hospital insurance

Two measures of the affordability of private hospital services are:

- the costs of private hospital insurance
- the proportion of the population with private hospital insurance.

In the case of the first indicator, the higher is the out-of-pocket cost of private hospital insurance the lower is the financial accessibility of private hospital services. The out-of-pocket cost for private hospital insurance rose from $957 to $1311 per policy or $451 to $631 per insured person between 2002-03 and 2007-08, after deducting for the private health insurance rebate (table 7.11). Since the average price of private hospital insurance rose slightly more quickly than average weekly earnings, the relative cost of private hospital insurance also rose slightly.

Drawing on data published by the Private Health Insurance Administration Council, the proportion of the Australian population that was covered by private hospital insurance (with or without ancillary cover) grew from 43.4 per cent of the population in 2002-03 to 44.7 per cent in 2007-08 (table 7.11).

The data indicate that even though financial accessibility slightly worsened during this period, the accessibility of private hospital services improved with the increased take-up of private hospital insurance.

Table 7.11 **Average cost and population coverage of private hospital insurance, 2002-03 to 2007-08[a]**

		2002-03	*2003-04*	*2006-07*	*2007-08*	*Average annual change*
Cost per policy						%
Current prices[b]	$	957	1 053	1 274	1 311	6.5
Share of earnings[c]	%	2.6	2.7	2.9	2.8	2.2
Cost per insured person						
Current prices[b]	$	451	497	608	631	6.9
Share of earnings[c]	%	1.2	1.3	1.4	1.4	2.6
Population coverage[d]						
No. of persons covered	'000	8 639	8 627	9 145	9 534	2.0
Share of population	%	43.4	42.9	43.5	44.7	..

[a] Hospital-only insurance, excludes ambulance and general (ancillary) care. [b] After deducting for private health insurance rebate. The deduction for the rebate is allocated on a pro-rata basis between hospital and general (ancillary) health insurance components. [c] Average annual earnings, all persons, full time and non-full-time workers. [d] Includes hospital-only and hospital and ancillary cover. **..** Not applicable

Source: PHIAC (2003, 2004, 2007a, 2008); ABS (*Average weekly earnings*, Cat. no. 6302.0); Productivity Commission estimates.

Elective surgery separation rates

Separation rates for public and private hospitals is an indirect measure of hospital usage and therefore equity of access. Its advantage is that it provides a consistent basis for comparing levels of equity of access across sub-populations such as socioeconomic status, Indigenous status, gender, and remoteness status of the patient, as well as the hospital.

Separation rates are defined as the number of separations per 1000 population and are standardised for age. This approach 'incorporates an assumption that levels of "need" are the same, on average, for different populations, or that variation in need can be accounted for using data analysis (such as age standardisation)' (AIHW 2008e, p. 6).

Australian hospitals provided approximately 1.6 million elective surgery separations in 2004-05 (the latest year for which the AIHW published these statistics). Private hospitals undertook more elective surgery separations (48.3 separations per 1000 population, age-standardised) than public hospitals (31.0 separations per 1000 population) (table 7.12).

Table 7.12 **Elective surgery separation statistics, 2007-08[a]**

	Public elective surgical separations	*Private elective surgical separations*	*All elective surgical separations*
By patient's remoteness category[b]			
Major cities	26.0	54.1	80.1
Inner regional	34.3	49.1	83.4
Outer regional	36.7	40.5	77.2
Remote	35.3	32.5	67.8
Very remote	30.3	20.5	50.8
All patients	29.0	52.0	81.0
By patient's socioeconomic status[c]			
Most disadvantaged	37.9	37.9	75.7
Second most disadvantaged	34.0	45.0	79.0
Middle quintile	30.6	51.0	81.6
Second most advantaged	24.9	55.7	80.6
Most advantaged	16.9	69.1	86.0
All patients	29.0	52.0	81.0
By patient's Indigenous status			
Indigenous Australians	38.1	9.9	47.9
Other Australians	27.7	50.2	77.9
All persons	27.8	49.6	77.4
By patient's gender[d]			
Male	27.3	42.8	70.1
Female	34.9	54.6	89.4
All patients	31.0	48.3	79.2

[a] Rates of separation per 1000 people, age-standardised to the estimated resident population 30 June 2001. [b] Australian Standard Geographical Classification, Remoteness Areas. Coverage of the linked data by remoteness areas ranged from 60 per cent in Remote areas to 100 per cent in Major cities. [c] Socio-Economic Indexes for Areas (SEIFA) classification. Coverage by quintile of socioeconomic advantage/disadvantage ranged from 85 per cent for the Middle quintile to 100 per cent for the Most advantaged quintile. [d] 2004-05.

Source: AIHW (2008e, 2009a).

As a broad generalisation, patients from the most disadvantaged socio-economic areas and regional and remote areas were more likely to use public hospitals. Conversely, patients who were from more advantaged socio-economic areas, non-Indigenous or from the major cities were more likely to use private hospitals (table 7.12).

Consequences of hospital congestion

Hospitals operate a number of units and wards. The ability of a unit or ward to treat patients depends in part on its ability to refer them from one area of the hospital to another. For example, the ability of an emergency department to admit a patient depends on the availability of a ward bed. Similarly, the ability of a patient to be transferred from an emergency department or general ward to an intensive-care unit (ICU) bed depends on the availability of an ICU bed.

The ACHS reports several statistics that describe the extent of congestion (or 'bed blocking') within a hospital. As noted in chapter 6, the ACHS data are based on relatively few hospitals (between 30 and 60 hospitals for these statistics). The collection is voluntary, so there is a risk of sample selection bias. Finally, the statistics do not account for differences in casemix. The ACHS (sub. 13) noted that its data are not intended for benchmarking purposes but rather internal review processes.

The ACHS (2008) reported that the percentage of emergency department patients who waited longer than eight hours to be admitted increased from 25 per cent to 33 per cent between 2002 and 2007.[5] Except for 2006, there were no statistically significant differences between public and private hospitals.

The ACHS collects and reports three statistics on the accessibility to and from ICU and high-dependency unit (HDU) beds. These are the proportion of:

- patients who could not be admitted to an ICU because of a lack of ICU resourcing
- elective surgery deferred or cancelled due to lack of ICU or HDU bed
- patients who were transferred to another facility or area due to unavailability of ICU or HDU bed (ACHS 2008).

Even with the relatively small sample, there were statistically significant differences between public and private hospitals. For example, the percentage of patients that were not admitted to an ICU because of a lack of resourcing in public hospitals was 8.6 per cent compared to 1.2 per cent in private hospitals.

The ACHS also reported on the extent of delays on discharge from the ICU or HDU of more than 12 hours (ACHS 2008). Approximately 16 per cent of patient transfers from ICU or HDU to hospital beds were delayed in 2007, across the 38 reporting public and private hospitals. There was a statistically significant difference between public and private hospitals. The rate for private hospitals was 3.5 per cent compared to 18.4 per cent for public hospitals.

[5] Including patients who waited longer than eight hours and were planned for admission but discharged from an emergency department without reaching an inpatient bed, were transferred to another hospital for admission, or died in the emergency department.

FINDING 7.3

Timely access to elective surgery is less likely in public hospitals than in private hospitals. The relatively high bed occupancy rates in public hospitals restrict their ability to manage their unpredictable workload. Equity of access is more likely in public hospitals than private hospitals, since public hospitals provide relatively more elective surgery to patients from poor socioeconomic areas and from more remote areas of Australia.

7.3 Quality and patient safety

Hospital-acquired infections, an important aspect of quality and patient safety, were discussed in chapter 6. This section examines a selection of other quality and patient safety indicators of hospital care. The Melbourne Institute of Applied Economic and Social Research noted that measuring quality and patient safety is complex and that there is no concise measure:

> … hospital quality is a multifaceted concept that covers aspects such as effectiveness of treatment, timeliness of service delivery, quality of amenities, technological sophistication, incidences of in-hospital adverse events and so on. Constructing, comparing and synthesizing measures across different quality dimensions are a challenging task …
>
> The difficulty is compounded by the fact that often within a given quality dimension there exist multiple measures and/or outcomes. For example, in the case of in-hospital adverse events, there are more than 20 common measures covering four different aspects: hospital-acquired infections, operative and post-operative complications, sentinel events and obstetrics … (sub. 16, p. 6)

The Australian Commission on Safety and Quality in Health Care (ACSQHC) has worked with the AIHW to develop a set of indicators that can be used to measure hospital quality and patient safety (AIHW 2009g). Such a framework is intended to be useful for public and for private hospitals. In addition, there are indicator frameworks used for the NHA (appendix B); by the National Health Performance Committee and the SCRGSP (appendix C); and by the Women's and Children's Hospitals associations, the Australian Healthcare and Hospitals Association, the Australian Private Hospitals Association, and state and territory health departments.

Given the potentially very large number of possible indicators, the Commission has selected those indicators that best indicate whole-of-hospital performance. That is, the indicators that can be widely applied and are not disease or injury specific. In addition, the Commission has reported only those indicators for which data are published for both public and private hospitals (box 7.2).

Box 7.2 **Quality and patient safety indicators**

Indicators for which the Commission has reported publicly available data include:

- accreditation
  - the proportion of hospitals and beds that are accredited
- readmission and returns
  - the rates of unplanned readmissions to hospital within 28 days of a surgical admission
  - the rates of unplanned return to theatre or operating room during an admission
  - the rates of unplanned return to an ICU within 72 hours of discharge
- adverse events
  - patient falls
  - pressure ulcers
  - complications of blood transfusion
  - adverse drug events
- intentional self-harm (and suicide)
- obstetrics
  - foetal, neonatal and perinatal mortality rates
  - caesarean section rates

Accreditation

Accreditation indicates that a hospital regularly reviews its programs, services and organisation to ensure processes are in place to support quality of care to patients (ACSQHC 2008). Accreditation does not mean that errors do not occur, but that processes are in place to support quality care and that those processes are checked regularly.

Hospital accreditation is currently available through a number of providers, with most public and private hospitals seeking accreditation as members of the ACHS. In January 2008, 95 per cent of public hospitals and day procedure facilities and 97 per cent of private hospitals and day procedure facilities were accredited (ACSQHC 2008). Since June 2008, the Private Health Insurance (Accreditation) Rules 2008 (Cwlth) have required hospitals that provide privately insured services to be accredited.

The ACSQHC noted that it is currently developing an alternative model for safety and quality accreditation (ACSQHC 2008).

Unplanned readmissions and returns

The three indicators of unplanned readmissions and returns include:

- unplanned readmissions after 28 days of a surgical admission
- unplanned return to ICU (or HDU) within 72 hours of discharge
- unplanned return to operating room during an admission.

An indicator of whether a hospital's care is clinically effective is the extent to which a discharged patient is subsequently readmitted for the same or substantially similar clinical condition in a relatively short space of time (SCRGSP 2009). One such measure is the unplanned (and unexpected) readmission to hospital within 28 days of a surgical admission. Unplanned/unexpected readmissions are included in the reporting structure for the NHA (COAG 2008d).

There is currently only one national collection that reports this indicator. The ACHS reported that unplanned and unexpected hospital readmissions within 28 days declined from 2 per cent in 2003 to 1.2 per cent in 2007 (ACHS 2008). From a sample of between 310 and 334 hospitals, of which approximately 170 were private, there were no statistically significant differences observed between public and private hospitals between 2003 and 2005, though private hospitals reported lower rates of readmission in 2006 and 2007.

A high rate of unplanned readmission into an ICU may reflect less than optimal management of a patient (including ward management), or a patient's early discharge to accommodate other ICU admissions (ACHS 2008). The rate of unplanned readmission to ICU is defined as the number of unplanned readmissions into an ICU within 72 hours of discharge from an ICU divided by the number of admissions into an intensive care unit.

The rate of unplanned readmissions to an ICU was 1.7 per cent in 2007 (ACHS 2008). This rate has been relatively constant since 2001. Though some jurisdictions exhibited statistically significant different rates relative to the group average, there were no statistically significant differences reported for public and private hospitals.

A related indicator is the extent to which patients are unexpectedly returned to an operating room (theatre) after surgery during the same admission. Unplanned return to theatre has been proposed by the AIHW for inclusion in a national set of safety and quality indicators (AIHW 2009g).

As with unplanned readmission to hospital, there is only one national data collection that reports this indicator. The ACHS reported that 0.41 per cent of patients experienced an unplanned return to theatre in 2007 (ACHS 2008). From a sample of between 274 and 291 hospitals, the rate remained largely unchanged between 2003 and 2007, and there were no statistically significant differences between public and private hospitals during this period.

Limitations of indicators

There are four limitations to the reported statistics on readmissions and returns to theatre.

First, no account has been made for the considerable differences between hospitals in the policy environments in which they operate, the diseases they treat, and their geographic locations. To ensure that indicators meaningfully reveal the underlying characteristics of a hospital rather than those of its external operating environment, it is important that there is some process for standardising or adjusting for such differences. The meaningfulness of these statistics would be improved if they were adjusted for:

- hospital casemix (for example, specific diagnostic categories such as chronic heart failure and chronic obstructive pulmonary disease are believed to be at higher risk of readmission)
- patient-risk characteristics, such as age, gender and comorbidities
- the extent to which the patient receives ongoing support outside of hospital after discharge (such as from outpatient clinics, community and family support services)
- the extent to which the patient complies with the prescribed self-management strategies (Hasan 2001; SCRGSP 2009).

Second, while 300 or so hospitals represent a relatively large sample of public and private hospitals, given the voluntary nature of the ACHS Clinical Indicator Program, it is likely that there is an element of self-selection in the data. Statistics based on a census would provide a more accurate measure of the differences between public and private hospitals.

Third, for readmission rates to be meaningful, care must be taken to distinguish between a readmission and the recurrence of a chronic condition (such as asthma) (AHSA, sub. 1).

Fourth, the reported readmission rates are likely to be understated, since a number of patients are admitted to another hospital and those admissions are not counted towards the readmission rates. The Commission sees merit in using linked datasets, such as the Western Australian Data Linkage System and the NSW and ACT Centre for Health Record Linkage, to establish more reliable estimates of readmissions to hospital.

Adverse events

According to the Royal Australasian College of Surgeons (RACS 2008, p. 13), ‘an adverse event is defined as the unintentional harm arising from an episode of healthcare and not due to the disease process itself’. According to the AIHW (2009a, p. 53), adverse events:

> … include infections, falls resulting in injuries, and medication and medical device problems. Some of these adverse events may be preventable.

There are several data collections that provide data on the prevalence, causes and consequences of adverse events. These include:

- National Hospital Morbidity Data Collection (NHMD) — a national data collection of episodes of hospital care that include information on the diagnoses and treatments for adverse events
- state- and territory-based incident reporting systems — which cover the extent, seriousness, causes and consequences of a variety of incidents, as reported by healthcare staff. A well-known example is the Australian Incident Monitoring System (AIMS)
- sentinel event reporting — which is the reporting of a very limited range of serious adverse events, in which death or serious harm to a patient has occurred
- mortality reviews — such as those undertaken by medical peer committees (such as by surgeons and anaesthetists), in specific contexts (such as maternal mortality review committees) and coronial inquiries (which establish the cause of death).

A fifth source of data is the detailed clinical information compiled by physicians during the course of surgical and medical care for use in detailed audit reports. An example is the Australian Orthopaedic Association’s *National Joint Replacement Registry*.

National Hospital Morbidity Data Collection

The NHMD is one of two national collections of adverse events that can provide insights into public and private hospitals. The AIHW regularly publishes data on the percentage of hospital separations for which there were associated adverse events (AIHW 2009a) (table 7.13).

Table 7.13 **Hospital separations with an adverse event, 2002-03 to 2007-08[a, b]**

Per cent

	2002-03	*2003-04*	*2004-05*	*2005-06*	*2006-07*	*2007-08*
Public hospitals						
External cause codes[c]						
Adverse drug, medicament or biological substance effects	1.4	1.6	1.7	1.8	1.8	1.8
Misadventures to patients	0.2	0.2	0.2	0.2	0.2	0.2
Procedures causing abnormal reactions/complications	3.1	3.3	3.4	3.4	3.4	3.2
Other external causes	0.1	0.1	0.1	0.1	0.1	0.1
Place of occurrence codes[d]	4.4	4.7	5.0	5.3	5.4	5.2
Diagnosis codes[e]	5.1	5.4	5.6	5.8	5.9	5.6
Private hospitals						
External cause codes[c]						
Adverse drug, medicament or biological substance effects	0.6	0.7	0.7	0.7	0.7	0.6
Misadventures to patients	0.1	0.1	0.1	0.1	0.1	0.1
Procedures causing abnormal reactions/complications	2.6	2.6	2.7	2.8	2.8	2.7
Other external causes	–	–	–	–	–	–
Place of occurrence codes[d]	3.1	3.3	3.4	3.6	3.6	3.5
Diagnosis codes[e]	3.6	3.6	3.7	3.9	3.8	3.7

[a] Separations for which the care type was reported as *Newborn* with no qualified days, and records for *Hospital boarders* and *Posthumous organ procurement* have been excluded. [b] Percentages are not equal because multiple diagnoses and external causes can be recorded for each separation and external cause codes can be used together to describe an adverse event. [c] Includes ICD-10-AM categories Y40 to Y59, Y60 Y82, Y83-Y84, Y88 and Y95. [d] Includes ICD-10-AM codes Y92.22. [e] Includes ICD-10-AM codes E89, G97, H59, H95, I97, K91, M96, N99, T81.0, T81.4, T82-T85, and others included above (T80 to T88 and T98.3). – Nil or rounded to zero.

Source: AIHW (2004, 2005, 2006, 2007a, 2008b, 2009a).

The data are categorised by ICD-10-AM codes for diagnoses, places of occurrence, and external causes of injury and poisoning. These codes indicate that an adverse event was treated and *may* have occurred during hospitalisation (AIHW 2009a). The data do not, however, provide any indication of the seriousness and therefore consequences of the events.

An adverse event may be recorded for one classification but not for another, so the aggregates for the external cause, place of occurrence and diagnosis codes may not be equal. For example, the rates for place of occurrence tend to be lower than the diagnosis codes, indicating that not all diagnosed adverse events occurred in a health-care setting.

It would appear from these data that the incidence of adverse events was higher in public hospitals than for private hospitals. For example, adverse events were coded as having occurred in over 5 per cent of separations for public hospitals and between 3.4 and 3.7 per cent of separations for private hospitals in 2007-08 (table 7.13).

However, there are three reasons to treat these estimates with great care. First, the AIHW noted that the estimates probably under-represent the incidence of adverse events because other ICD-10-AM codes may indicate the occurrence of an adverse event or its treatment (AIHW 2009a). Second, the data do not distinguish between events that occurred in hospitals and those that did not. Third, as noted, the data do not directly measure the consequences of the adverse events.

Wilson et al. (1995) and Jackson (2008) have each estimated a higher prevalence of adverse events than those reported above. Wilson et al. (1995) reviewed the medical records of over 14 000 admissions to 28 hospitals in NSW and South Australia. They estimated that approximately 8.3 per cent of all separations involved in-hospital adverse events. About 4.9 per cent of adverse events resulted in mortality and 13.7 per cent resulted in a permanent disability.

Jackson (2008) used Victorian and Queensland data (which contained a flag to indicate if a condition arose during hospitalisation) to develop a method for quantifying and classifying hospital-acquired diagnoses, for the purpose of estimating the cost of adverse events. Jackson (2008) found that adverse events occurred in 12.3 per cent of separations. The introduction of a condition-onset flag in the NHMD from 2008-09 (DOHA sub. 32) should greatly improve the availability and reliability of the coded data on adverse events and hospital-acquired diagnoses.

Incident reporting data

State and territory governments have adopted a variety of incident monitoring systems for public hospitals (see for example, NSW Department of Health 2005b; DHS 2008; LAOS Victoria 2008; SA Department of Health 2006; OSQHC 2006), and many private hospitals have adopted their own systems. Data reported in ACHS (2008) draw on incident monitoring systems. Reported indicators include:

- adverse drug events

- adverse transfusion events
- patient falls
- pressure ulcers
- intentional self-harm (including attempted and actual suicide).

An examination of ACHS (2008) data suggests that there are no statistical differences between public and private hospitals for any of these indicators. However, there are also four reasons to be cautious about using incident reporting data such as those published by the ACHS. First, these data are self-reported by doctors and nurses. Although doctors and nurses are encouraged to record adverse events, the self-reporting nature of these collections means that there is likely to be a degree of under-reporting and differences in reporting rates between professions. For example, in a report on adverse events, the Office of Safety and Quality in Health Care (Western Australia) (2006) noted that 91 per cent of AIMS events were reported by nurses. The majority of these were patient falls, medication errors and behaviour-related incidents. The Auditor-General for Western Australia (2007) estimated that only about one-third of all adverse events are reported.

Second, the ACHS data are based on a voluntary survey of between 150 and 350 hospitals. Third, the data are not adjusted for possible differences arising out of casemix. Finally, adverse event data rely on the self-reporting of incidents as part of a hospital's incident reporting system.

Mortality ratios

Mortality statistics are regularly published by the AIHW (2007b). However, in-hospital mortality rates, with the exception of foetal, neonatal and perinatal mortality rates (SCRGSP 2009), are not generally reported.

Mortality statistics are potentially useful partial indicators of the quality and patient safety of hospitals. This is primarily because death is 'unequivocal and generally accurately reported' (Ben-Tovim et al. 2009, p. 1).

The Commission explored the possibility of calculating and reporting it own estimates of hospital standardised mortality ratios (HSMRs) based on data extracted from the NHMD. However, the absence of reliable hospital-level establishment identifiers in the NHMD meant that HSMRs could not be calculated.[6] Inclusion of

[6] The majority of states do not use the private hospital identifier field to identify actual hospitals. In some states, each private hospital identifier denotes several private hospitals within some kind

individual hospital establishment identifiers in all data submitted by jurisdictions to the NHMD would greatly enhance the utility of these data.

Obstetric indicators

Obstetric services represent a significant aspect of hospital services. There were over 500 000 pregnancy, childbirth and puerperium separations in Australia in 2006-07, of which about 350 000 took place in public hospitals and the remainder in private hospitals. Yet, unlike other hospital separations, pregnancy and childbirth are not injuries or diseases, and thus many of the quality and patient safety indicators described above are not relevant for this area of hospital activity.

The Commission examined the reporting frameworks of the SCRGSP (2009) and Women's Hospitals Australasia (2007), and concluded that there were some indicators that would be useful to report, including:

- episiotomy rates for all first births — the rate at which there is an incision of the perineum
- third and fourth degree tears for all first births
- foetal, neonatal and perinatal death rates
- rates of caesarean section for selected first births
- rates of significant blood loss within 24 hours following a vaginal birth.

The ACHS (2008) published some of these data for public and private hospitals. Its data suggest that the proportion of primiparous patients with an intact lower genital tract declined between 2001 and 2007 from 30.5 per cent to 26.3 per cent. While the incidence of second and third degree tears among primiparous patients was observed to have increased during this period, there is no consistent evidence to suggest a statistically significant difference between public and private hospitals.

Robson, Laws and Sullivan (2009) used 2001–2004 data from the National Perinatal Data Collection to study the outcomes of women delivering a single baby. They found that the rate of third and fourth degree perineal injury was 1.4 per cent in public hospitals and 0.8 per cent in private hospitals. Likewise, after adjusting for risk factors — such as maternal age, smoking status and number of previous pregnancies — babies born in public hospitals were more likely to have low Apgar scores, need high-level resuscitation or be admitted to a special care or neonatal intensive care nursery.

of health administrative or organizational boundary, while in other states the aggregation is at a much higher level, with very many hospitals merged together.

However, Pesce (2009) cautioned that it is not possible to extrapolate the findings made by Robson, Laws and Sullivan to conclude that private care provided by obstetricians, with its increased intervention rates, prevents perinatal mortality and morbidity in Australia. Tracy et al. (2009) and Chambers (2009) questioned the findings of the Robson, Laws and Sullivan study, considering that failure to account for the effects of low birthweight undermines its conclusions. Likewise, Evans, Malcolm and Gordon (2009) noted that less than 10 per cent of stillbirths occur during delivery, suggesting that differences in perinatal death rates are not related to hospital care or interventions performed during labour. Nevertheless, Coory et al. (2009) considered that:

> … the results from [Robson, Laws and Sullivan's] article might be due to confounding, but they should not be dismissed and should be investigated with more detailed clinical data.

The AIHW (2008d) reports foetal, neonatal and perinatal mortality rates for public and private hospitals. Each of these rates is lower in the private sector (table 7.14). However, caution should be exercised in interpreting these rates, as they have not been adjusted for different patient-risk characteristics, such as age, gender and comorbidities. The lack of risk adjustment is particularly problematic as there are few level III neonatal intensive care units located in private hospitals, suggesting that most of the sickest infants are treated in the public hospital sector.

Table 7.14 **Rates of foetal, neonatal and perinatal deaths by hospital sector, rate per 1000 births[a], 2006**

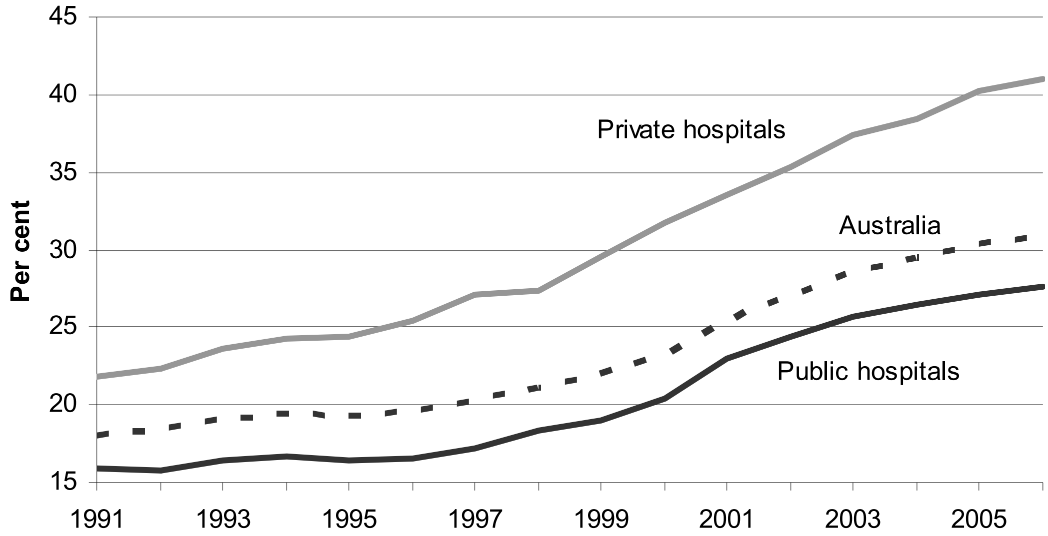
	Foetal deaths	*Neonatal deaths*[b]	*Perinatal deaths*[b]
Public	8.5	3.2	11.8
Private	6.7	2.7	9.5

[a] Foetal and perinatal death rates were calculated using all births (live births and foetal deaths). Neonatal death rates were calculated using all live births. [b] Numerators exclude neonatal deaths in NT. Denominators exclude live births in NT. Except in WA, these may exclude neonatal deaths within 28 days of birth for babies transferred to another hospital or readmitted to hospital, and those dying at home.

Source: AIHW (2008d).

There are no national data on rates of caesarean section for selected first births in public and private hospitals. The AIHW reports caesarean section rates for all births in public and private hospitals, although these rates are not adjusted for different patient-risk characteristics, such as age, gender, previous pregnancies and comorbidities. There has been a steady growth in the proportion of caesarean births in both public and private hospitals (figure 7.1). In 1991, 16 per cent of births in public hospitals and 22 per cent of births in private hospitals were caesarean births. By 2006, 28 per cent of births in public hospitals and 41 per cent of births in private hospitals were by caesarean section. Although the appropriate caesarean section rate is not known, the rise in caesarean section rates has prompted considerable concern (for example, Dietz and Peek 2004).

Figure 7.1 **Rates of caesarean section by hospital sector, 1991–2006**



Source: AIHW (2008d and previous issues).

The Commission approached the states and territories about obtaining unpublished data on episiotomy rates for all first births, third and fourth degree tears for all first births, and rates of significant blood loss. The data were not able to be provided in time for this study.

7.4 Developments to improve future comparisons

There are a large number of potential indicators that could be used to assess the performance of public and private hospital sectors. Most of these indicators are specific to particular illnesses, injuries and medical care, so they are not generally applicable for assessing the performance of hospital sectors. There remain, nonetheless, a large number of indicators that can be used for this purpose, as the Commission has found.

The Commission, however, encountered a paucity of comparative public and private hospital-level statistics. Many that are published have significant limitations, such as relatively small samples and problems surrounding the self-reporting of data. Where the Commission has sought to obtain unpublished hospital-level data, it faced considerable obstacles to accessing them in a timely manner. Many of these obstacles did not appear reasonable on privacy or confidentiality grounds, given the Commission's intended use and reporting of the data.

There are some initiatives underway that will lead to wider availability of hospital performance indicators. For example, implementation of the NHA, under which governments have agreed to report nationally-consistent 'progress measures' through the COAG Reform Council, should improve the reporting of partial productivity and access indicators for the public sector. It would be useful if the same methodologies were used when such data are collected from private hospitals.

There has also been progress towards national safety and quality indicators, with the Australian Health Ministers' Conference agreeing on 13 November 2009 to fast-track the implementation and reporting of a core set of nine national indicators of safety and quality for public hospitals (DOHA sub. DR69). Another set of hospital performance indicators is being prepared for the National Healthcare Agreement (appendix B). Additionally, the recent introduction of the condition-onset flag in the NHMD should greatly improve the availability and reliability of data on adverse events and hospital-acquired diagnoses.

Some of the quality and patient safety indicators proposed to the Commission are comparatively new for Australia, such as the open disclosure of adverse events. Open disclosure refers to the open discussion of incidents that result in harm to a patient while receiving health care. A successful open disclosure regime, as promoted by the Centre for Health Communication (University of Technology, Sydney), could yield significant benefits to the community, because the absence of such disclosure has been identified 'as a major reason for patients and family members to file complaints and pursue legal action' (Centre for Health Communication, sub. 3, pp. 1-2).

Yet developing quality and patient safety indicators alone is not sufficient. Long-term improvements to health outcomes need comprehensive public reporting of quality and patient safety by all hospitals. The ACSQHC (sub. 24), for example, argued for the reporting of safety and quality by both public and private hospitals.

The reporting of data should not be confined to jurisdictional or sectoral level data, as is the case with this report, but should be principally at the hospital level. Hospitals vary significantly, and reporting broad statistics masks the major variation that can occur between hospitals, as observed by the ACSQHC (sub. 24). It is hospital-level data, not jurisdictional, that health care consumers, providers, funders (private health insurers and governments), regulators and policy makers need to inform their decisions.

The Commission notes that the introduction of market mechanisms, like activity-based funding, may provide an incentive to expand the role for quality and patient safety data — particularly where quality and patient safety outcomes are tied to funding. Yet the hospital sector is likely to remain highly regulated, so there will remain a role for governments to facilitate this information provision.

FINDING 7.4

The work of the Australian Commission on Safety and Quality in Health Care and the Australian Institute of Health and Welfare to develop a national set of safety and quality indicators could provide a basis for future comparisons between public and private hospitals. However, the paucity of published, comparable and reliable hospital-level data severely limits these comparisons, and will continue to limit such comparisons in the future. Making consistent hospital-level data available to all interested parties would assist with future comparisons between hospital sectors and contribute to improvements in care.

8 Multivariate analysis

Key points

- Multivariate analysis can overcome some of the shortcomings of reporting individual partial indicators by generating a single measure of performance that simultaneously accounts for the diversity of hospital activity and the range of factors outside the control of hospitals.
- The Commission obtained the permission of 122 for-profit and not-for-profit private hospitals to use their hospital-level morbidity data. This group accounts for 60 per cent of private hospital sector separations.
- Together with data for 368 public acute hospitals and 18 non-government hospitals that provide public hospital services, the Commission had access to a unique dataset of 508 public and private acute hospitals.
- The Commission modelled a number of factors using stochastic frontier analysis. The factors considered included:
  - outputs — admitted patient, emergency department and outpatient activities
  - inputs — labour inputs, drug, medical and surgical supplies, and beds
  - quality and patient safety — in-hospital mortality
  - patient risk characteristics — comorbidity scores and socioeconomic status of patients
  - roles and functions — whether a hospital had a teaching role, and the complexity of services of the hospital.
- Factors that were found to influence hospital performance include higher comorbidity rates among patients, patients from lower socioeconomic areas and a greater proportion of medical cases and complex cases.
- Using data for 2006-07, it was estimated that, on average, the technical efficiencies of the hospitals within the sample were about 20 per cent below best practice.
- The efficiencies of public and private hospitals were broadly similar, except that:
  - large and very large private hospitals were slightly more technically efficient than public hospitals
  - very small and small public hospitals were more technically efficient than private hospitals, although this may in part reflect the way such hospitals were modelled in the analysis.
- The Commission will undertake further analysis using data for 2003-04 to 2006-07, where it will examine the cost performance of hospitals as well as the performance of individual peer groups of hospitals.

The partial indicators discussed in the previous chapters are readily computable and well understood by practitioners, but they suffer from at least two limitations. First, since they are by definition partial, no one indicator provides an overall assessment of a hospital's performance. Instead, a large number of indicators that cover costs, quality and patient safety need to be read in conjunction to infer an overall assessment of hospital performance.

Second, there are a large range of factors outside the control of a hospital that can influence its performance. These include the characteristics of its patients (such as the patient's Indigenous status, socioeconomic status, gender, age and comorbidities), and the roles and functions of the hospital (such as whether it provides teaching services). Many of the partial indicators presented in chapters 5 to 7 do not take account of these factors.

The multivariate analysis undertaken here has the potential to advance our understanding of the performance of public and private hospital systems. This chapter provides an overview of the data, methods employed in the multivariate analysis and the findings. A more detailed discussion is provided in appendix E.

The Commission examined the scope for improving technical efficiency for hospitals in 2006-07. The Commission intends to undertake further analysis into hospital costs, and to use additional years of data (2003-04 to 2005-06). The results are to be published in March 2010.

8.1 About the Commission's multivariate analysis

To measure 'what hospitals do' and 'how well they do their tasks', the Commission treated hospital establishments (and in some instances, campuses) as the principal object of measurement. It is generally at the hospital level that decisions are made to use a variety of 'inputs' (such as nurses, administration and clerical staff, medications, and technologies) to produce a range of 'outputs' (such as surgical medical and surgical procedures, emergency department episodes of care).

Measuring the relationship between inputs and outputs, known as the production function approach, is a well-established method for analysing the performance of hospitals (Hollingsworth and Peacock 2008) and establishments in other industries. In the case of hospitals, its chief advantage is that it permits public, for-profit and not-for-profit hospitals to be directly compared because the approach does not, unlike the cost function approach, depend upon hospitals behaving in a particular manner (such as minimising costs).

Technical efficiency

The production function approach permits the calculation of each hospital's technical efficiency. Technical efficiency is one of several measures of efficiency, and is the extent to which a hospital's outputs can be increased without increasing input use, or conversely, the extent to which inputs can be reduced without decreasing outputs. One of the first steps in measuring technical efficiency is to identify the factors that determine the frontiers (or best-practice benchmarks), against which each hospital will be compared. It is recognised that a hospital's range of services vary markedly due to a number of reasons, including the relative comorbidities of their patient population and the community's expectations about the types of services that hospitals should provide.

While technical efficiency is a measure of hospital performance, it is not a measure of cost efficiency. Technical efficiency represents whether the most is being made out of the hospital's scarce resources. Although technical efficiency contributes to a hospital's cost efficiency, a hospital's cost efficiency can be influenced by many other factors, including its price and input mix. It is entirely feasible that a hospital might be less technically efficient than another hospital, but because of superior buying power, might still be reported to have lower costs.

Stochastic frontier analysis

The Commission used stochastic frontier analysis (SFA) to estimate the production function and each hospital's technical efficiency. Like any other multivariate regression analysis, SFA allows for statistical relationships to be established between the dependent variable and the independent variables. In addition to establishing the 'slope' of the regression equation, the coefficients can also be interpreted as establishing the best-practice benchmarks faced by each hospital. This is the subject of section 8.4.

SFA also simultaneously determines the technical efficiency of each hospital after controlling for:

- factors that affect hospital performance
- random variations between hospitals reflecting
  - the effect of measurement error in the variables and other random factors that affect hospital outputs, such as disease outbreaks
  - the combined effects of other omitted factors, many of which cannot be measured.

Compared with alternative methods, such as data envelopment analysis, SFA yields more conservative estimates of the scope to increase output, because the estimated potential to raise output is determined after controlling for the identified factors, random events and differences among hospitals. The technical efficiency of public and private hospitals is reported in section 8.5.

A detailed description of SFA is provided in appendix E.

Scope of the analysis

The analysis covers hospitals only. It does not include the medical workforce — except to the extent that diagnostic and allied health professionals are also employed by each hospital. This scope differs from that of the cost analysis in chapter 5, which explicitly examined all of the costs incurred in supplying hospital services.

While the analysis considers the majority of public acute hospitals, only 122 private sector acute (overnight) hospitals are represented in the sample. The majority of these are for-profit hospitals. While this does not affect any conclusions drawn about the hospitals *in the sample*, care must be taken when inferring about the performance of the private hospital sector as a whole, and of not-for-profit hospitals in particular.

8.2 Profile of hospitals in the sample

The Commission obtained permission to access the morbidity and hospital establishment data for 703 public hospitals. The financial variables for a number of Victorian hospital observations were reported at the network level. Tasmania provided a single observation for all public hospitals. In both cases, the respective observations were disaggregated into hospital-level observations on the basis of casemix-adjusted separations or the number of beds.

The Commission also obtained the permission of 130 privately owned and operated hospitals to use their data and unique hospital identifiers in the study. The state and territory health departments in all jurisdictions agreed to supply their private hospital data and identifiers to the Commission except for Tasmania, which was unable to release the private hospital identifiers in time for this study.

From the total sample of 833 observations, 325 hospital observations were excluded as these were classified as non-acute, sub-acute, psychiatric or free-standing day hospital facilities. The remaining dataset comprises 508 public and private acute hospital observations for 2006-07 (table 8.1). One private hospital observation is an aggregate of all Tasmanian private hospitals. In total, there were observations for 368 public acute hospitals, 122 private acute hospitals and 18 hospitals that were classified ‘public contract’ because they were managed by non-government entities and offered public hospital services.

Table 8.1 **Profile of sample hospitals by location and size, 2006-07[a]**

	Major cities			*Outside major cities*			*All hospitals*
	Public	Private	Public contract	Public	Private	Public contract	
Very large	53	np	np	15	np	–	98
Large	21	16	np	16	6	np	70
Medium	14	26	–	31	12	–	83
Very small & small	8	np	–	210	np	np	257
All hospitals	**96**	**93**	**15**	**272**	**29**	**3**	**508**

a Sample refers to all the acute hospitals included in the Commission’s multivariate analysis. Hospital location is defined by the Australia Standard Geographical Classification (ABS 2001). Hospital size is defined by number of casemix-adjusted separations per year, where *Very large* refers to 20 001 or more casemix-adjusted separations; *Large* is defined as 10 001 to 20 000 casemix-adjusted separations per year; *Medium* is defined as 5001 to 10 000 casemix-adjusted separations per year; *Small* is defined as 2001 to 5000 casemix-adjusted separations per year; and *Very small* is defined as 2000 or fewer casemix-adjusted separations per year. **np** Not published due to confidentiality requirements but included in totals where applicable. – Nil.

Source: Unpublished ABS and AIHW data; Productivity Commission estimates.

The remaining acute private hospital in the sample account for around 60 per cent of all private hospital separations in Australia (excluding same-day facilities), with a higher representation of for-profit private hospitals compared to not-for-profit private hospitals (AIHW unpublished data).

Measures of output and productivity for the sample of hospitals included in the analysis are reported in table 8.2. These data indicate the volume and type of activity undertaken by hospitals, as well as the productivity of the inputs used. Observable differences between the public and private sectors can be used to identify the factors driving hospital efficiency and explain comparative differentials.

Service and patient characteristics of the hospitals in the analysis are profiled in table 8.3. Observable variations between public and private hospitals — in terms of the functions they undertake and the patients they treat — draw attention to the need to control for these factors when calculating and assessing their technical efficiency.

Table 8.2 **Profile of sample hospitals, output and partial productivity measures, 2006-07**[a]

	All hospital sizes				*Very large*		*Large*		*Medium*		*Small & very small*	
	Public	Private for-profit	Private not-for-profit	Public contract	Public	Private	Public	Private	Public	Private	Public	Private
Output measures (average, per hospital)												
All separations (not casemix-adjusted)	11 245	np	15 686	19 186	40 550	28 066	16 509	13 331	8 405	7 898	1 797	3 070
All separations[b]	11 571	np	18 173	20 216	45 032	32 910	15 297	14 591	7 166	7 229	1 410	2 840
Acute separations[b]	9 043	np	15 296	16 459	35 616	28 942	11 623	12 106	5 373	4 924	1 074	1 775
Pregnancy/neonatal separations[b]	1 245	np	1 446	2 077	4 819	1 663	2 003	1 499	606	679	134	79
Mental/alcohol services separations[b]	562	np	233	790	2 121	365	617	191	450	519	89	501
Other separations[b]	458	np	778	470	1 440	1 106	741	410	589	1 001	77	447
Emergency dept occasions of service	15 035	np	–	564	41 556	9 603	26 310	1 363	15 363	170	4 781	–
Outpatient occasions of service	34 371	np	–	42 409	136 634	1 826	45 265	251	17 725	1 953	4 059	2 642
Partial productivity measures												
Casemix-adjusted separations per staff[c]	22.9	np	63.2	32.2	25.3	61.7	27.3	66.8	26.1	71.4	20.6	60.9
Casemix-adjusted separations per bed	70.9	np	114.0	106.6	110.3	141.9	103.8	125.7	87.0	102.4	49.6	62.3
Patient days per bed	246.0	np	335.5	309.5	352.2	363.9	317.6	323.0	296.1	316.3	189.8	244.5
Patient days per staff[c]	84.8	np	196.0	94.2	82.2	157.6	86.3	175.9	95.3	224.1	83.1	234.5
Non-medical staff per bed	3.0	np	1.9	3.6	4.4	2.4	4.0	2.0	3.4	1.5	2.3	1.2
Occupancy rate	67.4	np	91.9	84.8	96.5	99.7	87.0	88.5	81.1	86.7	52.0	67.0
Average length of stay (days)	3.2	np	4.0	3.1	3.6	2.8	3.0	2.5	3.4	3.0	3.1	6.5
Number of observations	**368**	**94**	**28**	**18**	**68**	**24**	**37**	**22**	**45**	**38**	**218**	**38**

a Sample refers to all the acute hospitals included in the Commission's multivariate analysis. Data disaggregated by size excludes public contract hospitals due to confidentiality requirements. Private hospital data disaggregated by size refers to both for-profit and not-for-profit hospitals. **b** Casemix-adjusted. **c** Per non-medical staff member. **np** Not published due to confidentiality requirements but included in totals where applicable. – Nil or rounded to zero.

Source: Unpublished ABS and AIHW data; Productivity Commission estimates

Table 8.3 **Profile of sample hospitals, by service and patient characteristics, 2006-07[a]**

	All hospital sizes				*Very large*		*Large*		*Medium*		*Small & very small*	
	Public	Private for-profit	Private not-for-profit	Public contract	Public	Private	Public	Private	Public	Private	Public	Private
Services												
Medical DRG (% of separations)	75.7	np	53.5	63.8	72.7	45.7	68.3	37.3	66.3	48.0	79.8	60.4
Surgical/other DRG (% separations)	24.3	np	46.5	36.2	27.3	54.3	31.7	62.7	33.7	52.0	20.2	39.6
Same-day separations (% separations)	52.4	np	44.5	51.5	45.7	43.4	55.7	52.9	62.6	68.2	51.9	65.1
Cost weight (ratio)	0.84	np	1.01	1.05	1.10	1.15	0.94	1.03	0.91	0.93	0.73	1.08
E&W 1 – Complexity (ratio)[b]	0.55	np	0.68	0.94	1.45	1.13	0.91	0.74	0.63	0.36	0.20	0.12
E&W 2 – Compl. adj. for size (ratio)[b]	0.49	np	0.58	0.81	1.17	0.95	0.81	0.65	0.60	0.34	0.20	0.12
Teaching hospital (%)	17.1	np	75.0	44.4	75.0	95.8	24.3	15.6	4.4	68.4	0.5	60.5
Network (%)	6.8	np	–	–	23.5	–	13.5	–	20.0	–	5.5	–
Patient characteristics (average %)												
Funding election status												
Public	77.9	np	16.7	77.4	83.4	7.0	81.5	7.7	82.5	4.5	74.6	5.8
Private or other non-public	21.9	np	83.3	22.5	16.4	93.0	18.3	92.0	17.4	95.2	25.1	93.8
Residence												
From major city	26.4	np	66.0	78.4	71.2	80.4	54.1	71.3	34.3	67.8	6.0	66.5
From inner regional	36.2	np	23.7	14.1	20.2	13.3	36.5	18.3	31.1	24.3	42.2	25.6
From outer regional	26.5	np	9.1	7.0	7.2	5.5	6.1	9.6	30.9	7.2	35.2	7.3
From remote	5.0	np	0.9	0.3	0.8	0.7	1.6	0.6	3.0	0.4	7.3	0.5
From very remote	5.9	np	0.3	0.1	0.5	0.2	1.7	0.2	0.8	0.2	9.4	0.1
Index of socio-economic advantage												
SEIFA 1 (most disadvantaged)	40.3	12.4	24.3	19.9	21.4	14.3	28.4	15.6	36.5	14.0	48.9	16.6
SEIFA 2	26.5	15.2	11.1	18.9	22.4	12.5	22.3	14.8	26.7	17.5	28.4	11.9
SEIFA 3	16.6	26.0	13.7	17.8	22.7	18.9	17.7	28.0	17.1	18.6	14.4	27.5
SEIFA 4	9.9	23.5	20.7	24.7	18.3	25.4	15.8	24.6	13.7	23.6	5.5	19.4
SEIFA 5 (most advantaged)	6.8	22.9	30.2	18.8	15.1	29.0	15.9	17.0	6.0	26.3	2.8	24.6

(Continued next page)

Table 8.3 (continued)

	All hospital sizes				Very large		Large		Medium		Small & very small	
	Public	Private for-profit	Private not-for-profit	Public contract	Public	Private	Public	Private	Public	Private	Public	Private
Charlson comorbidity score												
Score 0 (no comorbidities)	74.1	82.2	70.9	71.2	69.4	72.2	75.0	80.5	71.3	81.6	76.0	81.8
Score 1 (fewest comorbidities)	9.1	5.2	6.6	7.2	7.6	5.9	7.0	5.4	8.1	5.4	10.2	5.4
Score 2	10.4	7.2	10.5	14.2	15.1	11.8	11.0	7.9	12.7	8.0	8.4	5.4
Score 3	1.6	1.1	1.5	1.6	1.9	1.1	1.4	0.8	1.7	1.3	1.6	1.3
Score 4	1.5	0.5	1.2	1.3	1.7	1.0	1.4	0.7	2.6	0.6	1.3	0.6
Score 5	2.6	3.6	8.2	3.6	3.6	7.6	3.7	4.3	3.0	2.8	2.1	4.9
Score 6 or higher (most comorbid.)	0.5	0.2	1.0	0.9	0.7	0.4	0.5	0.3	0.6	0.2	0.4	0.6
Average score	0.55	0.42	0.72	0.70	0.73	0.72	0.60	0.43	0.67	0.39	0.46	0.47
Age												
<1yr	2.2	np	2.0	2.8	3.4	0.7	3.2	1.1	1.6	1.4	1.7	0.9
1-4yrs	2.9	np	2.5	3.1	3.6	1.2	4.6	1.1	2.0	1.2	2.6	1.4
5-14yrs	3.9	np	3.2	4.0	4.8	1.6	5.4	1.9	2.9	2.0	3.6	2.0
15-49yrs	36.1	np	30.2	38.7	35.8	30.2	35.9	36.1	34.7	34.1	34.5	33.4
50-59yrs	12.2	np	15.6	12.7	11.9	17.6	11.6	17.3	13.1	14.8	12.2	18.3
60-69yrs	13.8	np	17.1	13.6	13.8	19.0	13.3	17.6	15.6	16.3	13.5	15.3
>70yrs	28.8	np	29.4	25.1	26.8	29.7	25.9	24.8	30.0	30.2	29.7	28.8
Female, share	0.53	np	0.55	0.55	0.53	0.52	0.55	0.55	0.54	0.58	0.53	0.56
Indigenous, percentage	9.1	np	0.7	2.1	4.2	0.3	5.0	0.8	6.2	0.3	12.0	0.2
Quality indicator												
Mortality rates	1.36	0.42	3.97[c]	1.30	1.14	0.70	0.98	0.57	1.15	0.46	1.54	2.74
Number of observations	**368**	**94**	**28**	**18**	**68**	**24**	**37**	**22**	**45**	**38**	**218**	**38**

[a] Sample refers to all the acute hospitals included in the Commission's multivariate analysis. Data disaggregated by size excludes public contract hospitals due to confidentiality requirements. Private hospital data disaggregated by size refers to both for-profit and not-for-profit hospitals. [b] Evans and Walker index of complexity (appendix E). [c] Subject to outlier observations (median is 0.70). **np** Not published due to confidentiality requirements but included in totals where applicable. – Nil or rounded to zero.

Source: Unpublished ABS and AIHW data; Productivity Commission estimates.

Output

Public hospitals report a lower volume of average casemix-adjusted separations than not-for-profit private hospitals. The extent of variation among public hospitals, however, is much larger than that of the private hospitals in the sample. Public contract hospitals report the highest average volume of activity compared to all other hospitals included in the sample.

Emergency department services are concentrated in the public hospital sector. There are no emergency departments in any of the not-for-profit private hospitals in the sample. A similar pattern of activity is observed for outpatient services. A high volume of outpatient service activity, on par with public hospitals, is reported for public contract hospitals. Public contract hospitals, not surprisingly, show similar characteristics to very large and large public hospitals.

Partial productivity measures

Rates of separations per non-medical staff member and per bed are higher among private hospitals than among public hospitals. This differential is consistent across all hospital sizes and is applicable to not-for-profit private hospitals. The same trends are observed for patient days per non-medical staff member and per bed. For these partial productivity measures, the public contract hospitals in the sample generally report rates that are higher than public hospitals yet lower than private hospitals.

Similar occupancy rates are reported for public and private hospitals, except in the small and very small size category, where private hospitals report a higher rate than public hospitals.[1] This differential has the effect of reducing the average rate for all public hospitals relative to all private hospitals. Not-for-profit hospitals report relatively high average occupancy rates. Public contract hospitals report a similar rate to private hospitals.

Public hospitals report a higher average length of stay (ALOS) than private hospitals, except in the small and very small hospital category, where private hospitals have a higher ALOS. This differential has the effect of increasing the average value for all private hospitals relative to all public hospitals. Negligible difference is observed in ALOS between not-for-profit and public hospitals, while public contract hospitals report a similar ALOS to public hospitals.

1 The occupancy rates count same-day separations as one day's length of stay.

Services

The data confirm that public hospital activity is concentrated in medical separations, whereas private hospital activity is more evenly spread across medical and surgical or other separations. The average share of surgical or other separations for public contract hospitals is smaller than for private hospitals but higher than for public hospitals.

A hospital's share of same-day separations is greater for public hospitals in the larger hospital sizes, but greater for private hospitals among the smaller hospital sizes. Public contract hospitals report a similar rate to the public hospital average.

Consistent with the findings reported in chapter 5, the average cost weights indicate that private hospitals undertake, on average, relatively more complex cases than public hospitals. This differential is greatest in the small and very small size category. The Commission found there to be little material difference between the average public hospital cost weights for public and private hospitals combined (appendix D).

A larger share of private hospitals in the sample, on average, are classified as teaching hospitals, compared to public hospitals. This is apparent across all hospital sizes except in the large category. These data, however, do not capture the *extent* of teaching activity undertaken by the hospital, and therefore does not distinguish between major teaching hospitals and hospitals offering relatively smaller teaching functions.

Finally, based on the observed distribution of hospitals that belong to a network, it may be expected that any potential efficiency effects related to network membership will be detected among the larger size hospitals.

Patient characteristics

The Charlson index (Charlson et al. 1987) is a measure of the comorbidity of patients. It is an odds-ratio of the risk of mortality within one year. Thus a Charlson score of 6 indicates a 6:1 chance of the patient dying within one year. The Charlson index for this study was prepared using administrative data based on the ICD-10-AM codes (Quan et al. 2005; Sundarajan et al. 2004,).

Very large public and private hospitals treat patients of similar comorbidity levels (based on the average Charlson score). Medium and large public hospitals treat relatively more comorbid patients than private hospitals. Not-for-profit private hospitals treat relatively more comorbid patients than do for-profit private patients.

The most comorbid patients (Charlson score of 5 or more) collectively constitute a larger share of patients in private hospitals than in public hospitals, except in the medium hospital size category. This difference between public and private hospital samples seems to be driven by the patient mix in not-for-profit private hospitals.

The Socio-Economic Index for Areas – Relative Socio-economic Advantage and Disadvantage (SEIFA) is a measure of the relative advantage and disadvantage of people in different geographic areas (ABS 2998a). For this study, the SEIFA 2001 index was calculated for each patient based on their postcode of the usual place of residence.

SEIFA data indicate that patients from the most disadvantaged socio-economic areas constitute a larger share of patients in public hospitals than in private hospitals. This differential is particularly apparent in the small and very small size category. With respect to patients' socio-economics status, public contract hospitals treat a similar patient profile to private hospitals. The majority of private hospital patients are from major city or inner regional areas, whereas public hospital patients are drawn from a broader range of areas.

Public hospitals treat a relatively larger proportion of patients aged less than 14 years, while private hospitals treat a relatively larger proportion of patients aged 50 to 69 years. Similar distributions are observed for all other age categories, including patients aged 70 years and older. Public and private hospitals treat similar proportions of patients on the basis of gender. Indigenous patients represent a larger share of public hospital patients than private hospital patients. This difference is consistent across all hospital sizes but particularly apparent among the smaller hospitals.

8.3 Factors affecting hospital performance

The Commission reviewed the literature for a large number of Australian and overseas studies that have benchmarked the performance of hospitals (a summary of which is in appendix E). A number of submissions to this study also highlighted factors that are thought to influence hospital performance. Not all factors identified in the overseas literature and submissions, however, were included in this analysis. Some variables were excluded because they were inconsistent with the specification of the model — for example, occupancy rates were not included in the production function because the variable is defined in terms of an output (patient days) divided by an input (beds). In other instances, suggested variables were not included because of a lack of suitable data.

In some instances, proxy variables were used instead. For example, since it is not possible to identify each and every policy, regulation and legislation in every state and territory, binary variables for each state and territory were used to control for these and any other jurisdiction-specific effects. For example, the New South Wales binary variable took on a value of '1' if a hospital was located in that state, and '0' if not. A variable was not defined for Queensland, because it was used as the reference category and doing so would introduce collinearity in the model.

Hospital outputs and quality of care

Ideally, a hospital's performance should be measured in terms of patient outcomes. Patients seek hospital services in order to improve their physical and emotional wellbeing relative to what would otherwise be the case. However, it is not practicable to directly measure the changes to patient health outcomes. Instead, the approach used here, is to use proxies for two dimensions of health outcomes — hospital outputs and quality of care.

Hospitals are complex entities that provide a wide range of services. Furthermore, hospitals vary significantly in terms of their functions and services, such as respective shares of surgical and medical procedures; the delivery of outpatient and emergency department care; and the provision of teaching services and clinical research programs. As such, there is a strong argument that hospitals should be modelled as multi-input multi-output firms (Butler 1995).

Hospital outputs

Admitted patient outputs used in the analysis were measured in terms of casemix-adjusted separations grouped into four categories based on the Australian system of major diagnostic categories (MDCs):

- acute separations — MDCs 1 to 9, 11 to 13, 16 to 18, 21 and 22
- pregnancy and neonate separations — MDCs 14 and 15
- mental and alcohol separations — MDCs 19 and 20
- other separations — MDC 23 (factors influencing health status and other contacts with health services).

MDC 10 (endocrine, nutritional and metabolic diseases and disorders) is used to normalise the output variables (for an explanation on the role of normalising the output variables, see appendix E). This MDC was used as the dependent variable in the regression analysis. All separations were casemix adjusted using public hospital cost weights (AR-DRG version 5.1).

The categories of non-admitted outputs used in the initial analysis were:

- accident and emergency services — number of accident and emergency department presentations or visits
- allied health and dental services — number of occasions of service for allied health, dental and other outpatient services
- mental and alcohol services — number of mental, alcohol and psychiatric outpatient services
- dialysis and endoscopy — number of occasions of service for dialysis and endoscopy
- diagnostic services — number of pathology and radiology services
- outreach services — number of community services, district nursing and other outreach services.

There is no national casemix classification for outpatient services, and so these services were not adjusted for inter-hospital differences in the types of cases treated.

Quality of hospital care

Several variables were available to the Commission to measure hospital quality, including in-hospital mortality, infection rates and adverse events. As noted in chapters 6 and 7, there are deficiencies in existing datasets on hospital-acquired infection rates and adverse events. Some of the problems include possible under-reporting and the difficulty in attributing the role of hospitals in contributing to the cause of those events.

The Commission chose to use in-hospital mortality rates as the sole measure of quality. However, this raises some issues. The rate of in-hospital mortality can vary for reasons outside the control of hospitals. Some hospitals might specialise in treating the most ill and at-risk patients. Other hospitals offer specialist palliative care facilities.

To account for these external influences, the Commission risk adjusted the mortality rates. The resulting risk-adjusted mortality ratios (RAMRs) (which are defined as the ratio of the observed mortality rate divided by the predicted mortality rate) were used in the stochastic frontier analysis. A positive coefficient for the RAMR variable in the production function would mean that hospitals which have lower mortality rates than predicted would have higher best practice frontiers. RAMRs differ from the more well-known hospital standardised mortality ratios insofar that the RAMRs do not account for differences in the services hospitals provide. A summary of the variables used in the risk-adjustment process and the resulting RAMRs is provided in appendix E.

Hospital inputs

Following common practice in this area of analysis, inputs into the production of hospital services included:

- nursing staff — number of full-time equivalent nursing staff
- diagnostic staff — number of full-time equivalent pathology and radiology staff
- other staff — number of full-time equivalent domestic, administration and other staff
- medical and surgical supplies — expenditure on medical and surgical supplies
- pharmaceutical supplies — expenditure on pharmaceutical supplies used in the delivery of hospital services
- other inputs — expenditure on other hospital (non-labour) inputs, such as administration and clerical, housekeeping, and repairs and maintenance not counted earlier
- beds — number of beds of the hospital as a proxy for hospital capital. This is given by the number of beds licensed in a private hospital, and the number of beds recorded in the National Public Hospital Establishment Collection for public hospitals.

The total number of beds is not an ideal measure of the usage of capital in a hospital as it does not accurately reflect the differences in capital stock between hospitals. Ideally, capital measures should be disaggregated such as by the number of ICU beds, non-acute beds, palliative care beds, the number of same-day chairs, and the number of operating theatres. Instead, differences in the capital of hospitals were captured in the analysis by using variables that reflected differences in the roles and functions of hospitals (see below).

Characteristics of patients

The characteristics of patients can affect hospital performance in two important ways. First, hospitals that serve catchments of relatively older or sicker patients will have higher activity levels and therefore will be observed to be providing more services to their community. In this instance, it is not necessary to account for the additional services demanded by patient populations as this activity will be reflected in the measures of casemix-adjusted separations.

Second, patients with more comorbidities consume more hospital resources per episode of care. Failure to account for differences in patient populations can lead to biased estimates of efficiency, because hospitals that serve relatively healthier patient populations will be observed to be using fewer resources. This problem is partly addressed with the casemix adjustment of hospital separations, where a number of individual AR-DRGs are defined specifically to account for differences in patient comorbidity. For example, the AR-DRG category 'B03 Extra cranial vascular procedures' is divided into sub-groups: 'B03A with catastrophic or severe complications' and 'B03B without catastrophic or severe complications'.

There is a case to include other variables that account for differences in hospitals' patient mix. Data for emergency department and outpatient services are not adjusted for casemix. Even if the detailed AR-DRG-level data adequately accounted for variation in patient morbidities, it is possible that the process of aggregating each of the AR-DRGs may diminish some of the statistical variation in morbidity necessary for robust estimation.

The patient-risk characteristics included in the model were:

- *patient comorbidity* — both the average Charlson score (Charlson et al. 1987) across all admitted patients for a hospital, and the proportion of patients with Charlson scores of 1, 2, 3, 4, 5 and 6 or more (where '1' is the least comorbid and '6 or more' the most comorbid)
- *socioeconomic status of patient* — proportions of patients with SEIFA scores of 1, 2, 3, 4 and 5 (where '1' is the most disadvantaged and '5' is the most advantaged)
- *gender* — proportion of females in the admitted patient population
- *Indigenous status* — proportion of the admitted patient population that self-identified as Indigenous
- *age profile* — proportion of the population that was less than one-year old, between 1 and 4 years old, between 5 and 14 years old, between 50 and 59 years old, between 60 and 69 years old, and 70 years old and over
- *remoteness of usual place of residence* — proportion of admitted patients whose usual place of residence was in major cities, inner regional, outer regional, remote and very remote areas, as defined by the ABS Australian Standard Geographical Classification – Remoteness Areas system (ASGC-RA).

A number of these factors are expected to be closely interrelated. For example, it is expected that the most comorbid patients will, on average, also be the oldest. Similarly, there is likely to be a strong association between a patient's socioeconomic status and the remoteness of their usual place of residence.

Role and function of hospitals

Another approach to addressing the differences between hospitals is in terms of their roles and functions. Hospitals that take on teaching roles incur additional overheads compared to those that do not teach. Public hospitals are increasingly being organised into networks in which member hospitals adopt specialist functions. For example, the larger hospitals in a local network might have level-III intensive-care unit beds in order maximise the utilisation of those beds.

A number of variables were used to explore differences in roles and functions. *Teaching status* is a binary variable that describes whether a hospital offers medical and/or nursing teaching services ('1' indicates that it offers teaching, '0' that it does not). The variable does not reflect the extent of teaching provided.

Level-III intensive-care, palliative and residential care units are three binary variables that indicate whether a hospital operates each of those units ('1' indicates that it operates a particular unit, '0' that it does not)

Proportion of patients treated with surgical and other procedures is a variable that describes the extent to which a hospital specialises in surgical and other DRG cases, or conversely, the degree to which hospitals undertake medical DRG cases. It is often suggested that a difference between public and private hospitals is the ability of private hospitals to maximise their productivity by specialising in elective surgery procedures, which permits them to operate with higher levels of productivity. On the other hand, public hospitals are unable to refuse medical admissions, and since medical DRG cases have a greater likelihood of being unplanned, medical DRGs become inherently more difficult for public hospitals to manage. Ignoring the differences between surgical and medical cases has the potential to distort the interpretations of efficiency measures.

Proportion of patients who are not treated as public patients is a proxy measure for the different levels of resources used by hospitals to treat public and non-public patients. It includes patients who are funded by private health insurance, Department of Veterans' Affairs, third-party motor vehicle accident, workers' compensation patients, and self-funding. Public hospitals are funded with capped budgets, at least when treating public patients. In contrast, the funding of non-public patients is uncapped. It is possible that differences between capped and uncapped funding provides hospitals with the capacity to provide different service levels to public and non-public patients.

Evans and Walker information indices (Evans and Walker 1972) are used as measures of the relative complexity of work undertaken by hospitals. Two such measures are considered here. The first is a measure of the complexity of hospital work. The second is a measure of the complexity of hospital work while recognising differences in hospital size. While larger hospitals generally treat more complex cases than smaller hospitals, due to their size, they are also expected to treat more complex cases. A detailed explanation and derivation of the indices is given in appendix E.

Care must be exercised when choosing which combination of these variables to include in the analysis, as they might be correlated and lead to distorted results. For example, the presence of level-III intensive-care units may be correlated with the Evans and Walker indices of hospital complexity. Similarly, it is possible that the hospital roles and functions variables may be correlated with the patient characteristic variables, if hospitals adopt certain functions because of their patient mix.

A number of other variables were considered for inclusion, but were subsequently dropped, because it was expected that they measure very similar effects and would be too highly correlated with other variables. For example, it would be expected that average length of stay and the proportion of same-day separations are highly correlated, and would implicitly be reflected in the casemix-adjusted separations measure of hospital outputs.

8.4 Factors contributing to best-practice benchmarks

The Commission analysed a number of models that have been used to examine the performance of hospitals. Ten models are reported in appendix E, two of which are reported in table 8.4. Each model differs in terms of the types of factors that were tested for their relative importance, and in terms of the how the variables are represented. Not all variables that were tested are reported in table 8.4.

The first model in table 8.4, the Cobb-Douglas model, includes variables on inputs and outputs, factors describing both roles and functions of hospitals, as well as patient characteristics. In addition to indicating the extent to which an independent variable influences the dependent variable, the estimated coefficients in this model also indicate how the frontier (or best-practice benchmark) is positioned for each hospital. A positively-signed coefficient indicates that the variable has the effect of shifting up a hospital's best-practice benchmark. This can be interpreted to mean that a hospital with the characteristics associated with the variable has a higher hurdle to meet when being compared with other hospitals. Conversely, a negatively-signed coefficient indicates the variable has the effect of lowering the hospital's best practice frontier, potentially making it easier for that hospital to meet its best-practice benchmark.

The second model (the restricted translog model) is similar to the first but has one important subtle difference. It includes 'squared' terms for the inputs and outputs to more accurately reflect the presence of scale economies within the hospital sector. By accounting for scale economies, the translog model better describes the data, and it is this model that is used to generate the final technical efficiency scores in table 8.5.

The interpretation of the input and output coefficients are more subtle, however. For every pair of input and output coefficients, the first coefficient describes the tendency of the best-practice frontier to be pushed up or pulled down, in much the same manner as the Cobb-Douglas model. The second (that is, squared) variable, describes the rate at which the frontier is pushed up or pulled down. For example, if an input variable had its first coefficient signed positive and its squared term signed negative, it would be possible to conclude that: hospitals with more of that input would have their frontier increased (positive first coefficient), but that the rate at which the benchmark was raised would diminish with further increases to the input (negative second coefficient).

None of the coefficients indicate the impact of the variables on a hospital's overall technical efficiency. Technical efficiency is determined by the position of the frontier after all adjustments are taken into account, as well as taking into account the effect of random error and omitted variables.

The findings presented here are based on the coefficients which have the highest level of significance. Broadly, the coefficients of outputs and inputs in the production model correspond to prior expectations.

Outputs and inputs

The negative coefficient sign for the output variables in the Cobb-Douglas model indicate that hospitals that provide a higher volume of services (both admitted patient services and non-admitted occasions of service) have their best-practice frontiers shifted downwards, when keeping all other factors unchanged. This means that hospital benchmarks reward those hospitals that produce more with their given resources. A number of the output variables become less statistically significant in the restricted translog model but their interpretation remains valid. For a number of outputs a negative signed squared term indicates that as the output is increased, the rate at which the frontier is shifted downwards is progressively diminished.

Table 8.4 **Coefficient results of stochastic frontier analysis, 2006-07**

	Cobb-Douglas model[a]		*Restricted translog model*[b]	
Primary model				
Inpatient services				
Log of acute separations	-0.506	***	-0.211	
Log of acute separations — squared			-0.022	
Log of pregnancy & newborn separations	-0.060	***	-0.052	***
Log of pregnancy & newborn separations — squared			-0.004	
Log of mental & alcohol separations	-0.106	***	-0.151	***
Log of mental & alcohol separations — squared			-0.019	***
Log of other separations	-0.151	***	-0.103	***
Log of other separations — squared			-0.016	***
Non-admitted services				
Log of emergency department visits	-0.021		-0.069	
Log of emergency department visits — squared			0.006	
Log of allied & dental health services	-0.050	***	0.105	***
Log of allied & dental health services —– squared			-0.024	***
Log of mental & alcohol services	-0.011		0.029	
Log of mental & alcohol services — squared			-0.003	
Log of outreach & district nursing services	0.004		0.010	
Log of outreach & district nursing services — squared			0.000	
Log of diagnostic services	-0.041	***	-0.027	
Log of diagnostic services — squared			0.000	
Log of dialysis & endoscopy services	0.031		0.014	
Log of dialysis & endoscopy services — squared			-0.018	
Inputs				
Log of nursing staff	0.241	***	0.678	***
Log of nursing staff — squared			-0.061	***
Log of diagnostic staff	0.030		0.036	
Log of diagnostic staff — squared			-0.003	
Log of other staff	-0.161	***	-0.152	
Log of other staff — squared			0.000	
Log of beds	0.462	***	0.075	
Log of beds — squared			0.068	***
Log drugs	0.068	***	-0.005	
Log drugs — squared			0.011	***
Log of medical & surgical supplies	0.015		0.246	***
Log of medical & surgical supplies — squared			-0.022	***
Log of other inputs	-0.012		-0.380	***
Log of other inputs — squared			0.028	***

(Continued next page)

Table 8.4 (continued)

	Cobb-Douglas model [a]		*Restricted translog model* [b]	
Patient comorbidities				
Percent of patients with Charlson 6 +	-6.518	**	-7.362	**
Percent of patients with Charlson 5	-1.520	**	-1.121	
Percent of patients with Charlson 4	-2.641	***	-2.079	**
Average Charlson comorbidity score	0.394	***	0.250	**
Patient SEIFA				
Percent of patients from SEIFA 3	-0.307	***	-0.216	**
Percent of patients from SEIFA 2	-0.332	***	-0.322	***
Percent of patients from SEIFA 1	-0.261	***	-0.238	***
Role and functions				
Teaching hospital	0.116	*	0.196	***
Evans & Walker Index 1	-2.098	***	-1.777	***
Evans & Walker Index 2	4.011	***	3.246	***
Percent of patients that are not public	-1.160	***	-0.993	***
Percent of separations that are surgical or other DRGs	1.131	***	0.862	***
State or territory[c]				
NSW	-0.090		-0.098	
Victoria	-0.277	***	-0.249	***
South Australia	-0.230	***	-0.134	
Western Australia	-0.069		0.009	
Tasmania	1.176	***	1.001	***
Northern Territory	-0.217		-0.342	*
ACT	-0.237		-0.253	
Constant	3.644	***	3.318	***
Secondary model				
Log σ_v^2				
Constant	-2.543	***	-2.495	***
Log σ_u^2				
Constant	-1.918	***	-2.560	***
Model criteria				
No. of observations	508		508	
Log likelihood	-311.3		-242.2	
Wald χ^2	7 345.2		9 830.1	
Probability > χ^2	0.0000		0.0000	
σ_v	0.280		0.287	
σ_u	0.383		0.278	
σ^2	0.226		0.160	
λ	1.367		0.968	

[a] Model 5 (appendix E). [b] Model 10 (appendix E). [c] Queensland is not listed because it was used as the reference category. *** Significant at the 1 per cent level. ** Significant at the 5 per cent level. * Significant at the 10 per cent level.

Source: Unpublished ABS and AIHW data; Productivity Commission estimates

The positive coefficients on the input variables of the Cobb-Douglas model indicate that hospitals that use relatively more of those inputs will have their best-practice frontier moved up, while keeping other factors unchanged. For nursing staff, the restricted translog indicates that increases to nurse staffing raises the best practice benchmark at a diminishing rate. For hospital beds, the coefficient indicates that the best-practice frontier is increased at an increasing rate.

The negative coefficients (Cobb-Douglas and translog models) of two inputs (other labour services and other inputs) appear to reflect the effect of a number of extraneous factors. This seems to be the result of the way the variables have been defined to include all other (residual) inputs to production.

Patient characteristics

Both the broad categories of patient characteristics — patient comorbidity (Charlson) and SEIFA — indices were statistically very significant. The groups of variables suggest that in hospitals that treat relatively more comorbid or economically disadvantaged patients, the best-practice benchmarks are lowered (in both the Cobb-Douglas and translog models), particularly at the higher levels of comorbidity and lowest levels of socioeconomic advantage.

Variables describing the patient's age and the ASGC-RA of their usual place of residence were not included in either Cobb-Douglas or translog models, and so were not reported in table 8.4. Patient age was found to be related with comorbidity, and the geographic remoteness of residence was thought to be too closely related with the patient's SEIFA index.

Role and function

Hospitals with a relatively higher share of non-public patients were found to have a lower best-practice frontier. This may indicate that non-public patients, compared to public patients, are more resource intensive for hospitals. This may reflect the way in which hospitals differentiate their services to public and non-public patients by, for example, offering additional services such as clinical interventions and private ward accommodation to non-public patients.

A hospital's share of surgical and other procedures was found to raise the hospital's best-practice frontier. This is equivalent to finding that hospitals that specialise in medical DRG cases need to have the best-practice frontier adjusted downwards. This finding strengthens the view that surgical procedures are less resource intensive and simpler to manage than medical cases.

The two Evans and Walker indices should be interpreted jointly. The first index indicates that the more complex the caseload that hospitals have, the further inwards the best-practice frontier is positioned. The second index indicates, however, that this effect is offset by hospital size. While larger hospitals are expected to take on more complex cases, they do not appear to be taking on as many complex cases as their size would suggest, so their best-practice benchmarks are adjusted accordingly.

A hospital's teaching status was found to raise a hospital's best-practice frontier. If trainee doctors and nurses were less productive than their fully trained counterparts, one would expect the coefficient to be negatively signed. Instead it seems that the binary nature of the variable is identifying extraneous influences on hospital performance.

Other variables

Variables indicating the states and territories in which the hospitals were located were included to control for differences in state and territory policies, regulations and legislation, which cannot be reflected elsewhere in the model. The significance of the coefficients for Victoria and Tasmania is likely to reflect, in part, the fact that some of their hospital data was provided in aggregated form. Even though attempts were made to rescale the data appropriately, it is possible that inconsistencies still exist that are least are being controlled for by these variables (appendix E). The significance of the Victorian coefficient may also pick up the effect of network membership.

The RAMR variable, as a proxy for the quality of health care, was found to be insignificant in the model and is not reported here. It was found to be highly correlated with the various Charlson indices, and was consequently dropped from the final analysis. The insignificance of the RAMR variable suggests that the quality of hospital care, as modelled here, does not have a sufficiently strong effect on hospital output. The significance of the Charlson and SEIFA variables suggests that patient characteristics affect hospitals output directly. The Commission intends to examine alternative methods to incorporate a quality control factor in future analyses.

FINDING 8.1

A multivariate analysis of Australian hospital-level data established the best-practice benchmarks for each hospital in the sample. The benchmarks were influenced by a number of factors. The best-practice benchmarks were lower for hospitals that treat:

- *highly morbid patients*
- *patients from lower socioeconomic communities*
- *relatively more medical cases, as these cases are more difficult to manage*
- *more complex cases, although this is less so for the largest hospitals.*

8.5 Hospital efficiencies

The previous statistical analysis focused on identifying the factors that influence the best-practice frontier of each hospital. The next step is to estimate how far hospitals are from their respective frontiers.

A hospital's technical efficiency is measured as an index with a possible value ranging from zero to less than one. If a hospital has a technical efficiency index of 0.80, it is producing 20 per cent less output than it potentially could achieve if it met its hypothetical benchmark. No hospital has a ranking of 1.00, as each hospital's benchmark is uniquely determined using all of the observations in the data set, not just a few neighbouring peers. Put simply, even the best performing hospitals can still learn from others on how to improve their performance.

The indices of technical efficiency from the restricted translog model (table 8.4) are presented in table 8.5. The efficiency scores already account for differences in hospital size. That is, the technical efficiency scores *do not* reflect the effects of scale economies. Public, for-profit private and not-for-profit private hospitals within this sample were operating with mean efficiencies between 0.75 and 0.80 of the best practice efficiency in 2006-07, although this appears to be pulled downwards by the small and very small hospitals.

There are perceptible differences between various groupings of public and private hospitals, and with those hospitals that are not managed by governments as public hospitals. However, care must be exercised when comparing across groups as there is a large variation in the efficiencies among the members of these groups.

The mean efficiencies of very large and large private hospitals are estimated to be slightly higher than similarly-sized public hospitals. In contrast, the mean technical efficiencies of very small to medium sized public hospitals tend to be higher than for similarly-sized private hospitals. However, caution needs to be exercised when interpreting the results for very small to medium hospitals as there is a wide range between the 5th and 95th percentile technical efficiency scores. For example, the range for very small and small private hospitals is 0.203 to 0.919, suggesting that there are a variety of activities among these hospitals that are yet to be fully accounted in the model.

Table 8.5 **Summary of hospital technical efficiency scores, 2006-07[a]**

		Public hospitals	Private hospitals			Public contract hospitals	All hospitals
			All	For profit	Not-for-profit		
All hospitals							
Mean	rate	0.797	0.750	0.751	0.747	0.800	0.786
Median	rate	0.816	0.822	0.818	0.838	0.805	0.816
5th percentile	rate	0.643	0.313	0.313	0.203	0.583	0.553
95th percentile	rate	0.901	0.916	0.917	0.906	0.908	0.906
No. of observations	no.	368	122	94	28	18	508
Very large hospitals							
Mean	rate	0.813	0.819	0.834	0.795	np	0.814
Median	rate	0.820	0.851	0.863	0.846	np	0.827
5th percentile	rate	0.708	0.655	0.659	0.639	np	0.683
95th percentile	rate	0.905	0.893	0.917	0.877	np	0.905
No. of observations	no.	68	24	15	9	np	98
Large hospitals							
Mean	rate	0.810	0.813	0.810	0.819	np	0.809
Median	rate	0.812	0.829	0.828	0.830	np	0.828
5th percentile	rate	0.648	0.752	0.457	0.757	np	0.644
95th percentile	rate	0.917	0.878	0.918	0.868	np	0.908
No. of observations	no.	37	22	15	7	np	70
Medium hospitals							
Mean	rate	0.803	0.780	0.791	0.707	np	0.741
Median	rate	0.815	0.841	0.820	0.876	np	0.780
5th percentile	rate	0.622	0.427	0.470	0.029	np	0.491
95th percentile	rate	0.907	0.931	0.931	0.906	np	0.915
No. of observations	no.	45	38	33	5	np	83
Small and very small hospitals							
Mean	rate	0.788	0.641	0.640	0.642	np	0.766
Median	rate	0.816	0.700	0.715	0.644	np	0.806
5th percentile	rate	0.575	0.203	0.208	0.203	np	0.415
95th percentile	rate	0.897	0.919	0.916	0.919	np	0.899
No. of observations	no.	218	38	31	7	np	257

[a] Based on restricted translog model 10 (appendix E). **np** Not published due to confidentiality.

Source: Unpublished ABS and AIHW data; Productivity Commission estimates.

These findings are broadly consistent with findings of other research undertaken by the Commission as part of its modelling of the potential benefits of the National Reform Agenda in 2006. The Commission had reviewed published research on hospital performance, from which it concluded that the gap between existing and best-practice productivity might be in the order of 20–25 per cent for the Australian (public and private) hospital sector as a whole (PC 2006a). This conclusion was based on a combination of the limited Australian research, particularly for the private sector, and overseas studies.

What are some of the contributing factors?

Why is it then that some hospitals appear to be better performing than others? Partial productivity, at least for admitted-patient care, is higher among private hospitals than for public hospitals. The productivity difference is noticeable for each of the partial measures of productivity — casemix-adjusted separations and patients days, per non-medical staff and per bed. For example, the number of casemix-adjusted separations per non-medical staff was 63.2 for not-for-profit hospitals and 22.9 for public hospitals (table 8.2). Similar patterns are evident for all sizes of public and private hospitals. This would suggest that private hospitals are more technically efficient than public hospitals.

Public hospitals, however, provide more non-admitted patient care than do private hospitals in this sample. Though the productivity numbers are not reported in table 8.2, productivity for these services will obviously be higher among public hospitals.

Public hospitals also undertake relatively more medical DRG separations (75.7 per cent) than do not-for-profit hospitals (53.5 per cent) as a proportion of their total activity. As estimated in table 8.4, medical DRG separations are more difficult to manage than surgical and other DRG separations, so public hospitals are regarded to have their best-practice benchmarks lowered in this regard. Similarly, public hospitals treat relatively more patients from the more disadvantaged socioeconomic regions of Australia than do private hospitals. For example, 40.3 per cent of all public hospital patients were from the most disadvantaged regions (SEIFA 1).

Similarly, private for-profit hospitals treated the least morbid patients. The average Charlson score for private for-profit hospitals was 0.42, compared to 0.55 for public hospitals, 0.72 for not-for-profit hospitals and 0.70 for public contract hospitals. These patterns are also evident in the highest Charlson comorbidity scores. Over 9 per cent of all the patients of not-for-profit hospitals had comorbidity scores of 5 or higher. These statistics contribute to lowering the best-practice frontiers of not-for-profit and public contract hospitals (and to a lesser extent public hospitals) further than for private for-profit hospitals.

The performance of smaller private hospitals

The efficiency scores for medium, small and very small private hospitals exhibited a considerable degree of variation (table 8.5). This suggests a degree of unexplained differences (heterogeneity) that has not been recognised in the model. Comparing these efficiency scores with some of the data in table 8.3 provides insights on such hospitals.

Small and very small hospitals appear to comprise two distinct groups — one that specialises in high-volume same-day procedures and another that specialises in long-stay cases. For example, the proportion of same-day cases in very small and small private hospitals is 65 per cent, compared to 52 per cent for public hospitals. Yet very small and small hospitals also have an ALOS of 6.5 days. These lengths of stay are likely to represent non- and sub-acute services provided by otherwise acute hospitals. The lengths of stay for these hospitals count against their reported productivity, and at the same time, so does the lack of complexity (as represented by the Evans and Walker indices). There is potential to more accurately model the performance of these hospitals.

FINDING 8.2

After controlling for differences in services provided and types of patients treated, the efficiency of public and private hospitals is, on average, similar. It was estimated that the output of individual hospitals in both sectors is, on average, around 20 per cent below best practice among the sampled hospitals. Among large and very large hospitals, the scope to improve technical efficiency is slightly greater for public hospitals. At the other end of the scale, the scope to improve efficiency is higher for small and very small private hospitals, although these results may be partly due to a number of factors that could not be accounted for in the analysis.

8.6 Further analysis

Given the delays in obtaining data faced by the Commission, the multivariate analysis presented in this report estimates hospital production functions and technical efficiency based on a single year of data (2006-07). Given the large number of hospital observations in this data set, the results are expected to be robust.

Nevertheless, the Commission intends over coming months to replicate this analysis using a larger data set that includes data from the earlier years of 2003-04 to 2005-06. Future analysis will also focus on examining the performance of hospitals for different peer groups (for example, to compare the performance of very large hospitals). The Commission will also extend this analysis to examine the determinants of hospital costs.

The Commission intends to publish the results from this further analysis in March 2010.

9 Informed financial consent

Key points

- Informed financial consent (IFC) occurs when patients undergoing treatment as a private patient receive relevant cost information about their treatment prior to the treatment taking place. IFC is important as it allows patients to make informed decisions.
- The latest available data show that currently around 85 per cent of hospital medical services provided to privately-insured patients do not have an associated gap payment, suggesting that most patients do not have a problem with IFC. Nevertheless, it is undesirable for any patients to incur gap payments without IFC.
- Survey data collected by Ipsos Australia are the only information source that is available to consider the provision of IFC and out-of-pocket expenses. These data are dated (2007 is the latest) and subject to potential sample-selection and self-reporting bias and should be interpreted with caution. These data suggest that a greater percentage of in-hospital services involve a gap than is actually the case.
- The 2007 Ipsos data for pre-planned admissions show that the IFC rate was:
  - lower in private hospitals (around 80 per cent) than public hospitals (about 90 per cent)
  - higher in Tasmania, South Australia, and inner regional areas across Australia (around 90 per cent in each case)
  - among specialists, lowest for paediatricians (around 60 per cent).
- The data also show that, at a national level, the IFC rate was relatively stable between 2004 and 2007, and for a range of disaggregations.
- At a national level, the average gap for people who did not provide IFC was around $800 and relatively stable between 2004 and 2007. However, few conclusions can be made when disaggregating further, due to small sample sizes.
- The medical profession has sought to promote best practice with respect to IFC in recent years, including through educational campaigns. In addition, individual specialists are using internet-based packages to inform patients about their likely out-of-pocket expenses.

The terms of reference ask the Commission to examine aspects of informed financial consent (IFC) for privately-insured patients. IFC occurs when patients receive relevant cost information, including notification of likely out-of-pocket expenses (gaps), desirably prior to agreeing to treatment. It is preferable for this information to be provided in writing.

The provision of relevant cost information prior to treatment is desirable as it allows patients to make more informed decisions about whether to continue to receive treatment from the particular practitioner(s) and to understand the full cost implications. However, it is not feasible for written notification to be provided in all circumstances, such as in many emergency cases.

Excesses and copayments are not considered out-of-pocket expenses because they are due to the patient's choice of insurable cover. An excess is the amount that a patient agrees to pay towards the cost of hospital treatment in exchange for a lower insurance premium. A copayment is a set amount that insured patients pay for each day they are in hospital in exchange for a lower insurance premium (PHIO 2009).

For the year to September 2009, there was no gap payment for 85 per cent of hospital medical services provided to privately-insured patients (not including hospital accommodation services) (PHIAC 2009a). For the remaining 15 per cent of services that did involve a gap, 4 percentage points involved known-gap agreements. In known-gap agreements there is a legal requirement for IFC to be provided. Thus, it could be argued that no more than 11 per cent of services should lack IFC. For the year to September 2009, this represented approximately 730 000 medical services (PHIAC 2009a).[1] Of this 11 per cent, the Australian Society of Anaesthetists (sub. 9) noted that 1–3 percentage points involve emergency cases, for which it is not always realistic to expect IFC. Nevertheless, it is undesirable for any non-emergency patients to incur out-of-pocket expenses without IFC, and desirable for as many emergency patients to receive IFC as is practicable.

The Private Health Insurance Ombudsman (sub. 26) noted that there has been a gradual decline in complaints received regarding IFC over recent years. The Private Health Insurance Ombudsman received 76 complaints about medical gap issues in 2007-08 (of which almost all concerned IFC), which was 39 fewer than the previous year, suggesting that the provision of IFC has been improving. However, there still seems to be a number of patients that do not receive relevant cost information prior to treatment.

Aside from analysing the provision of IFC and out-of-pocket expenses, this chapter discusses some potential impediments to the provision of IFC, available IFC data

[1] In 2008-09, there were 3 052 375 acute hospital episodes and 6 151 724 medical services involving privately-insured patients, therefore privately-insured patients are on average treated by approximately two medical service providers per episode of hospitalisation (PHIAC 2009a, 2009b).

sources and possible data developments, and best-practice examples of IFC provision.

9.1 Potential impediments to the provision of informed financial consent

Key impediments to IFC can include short lead times prior to treatment, treatment involving multiple service providers, and the complexity of some health insurance policies.

Short lead times and multiple providers of services

It is generally more difficult for specialists or other service providers to obtain IFC from patients for whom there is a short amount of time between the decision to undertake surgery and the actual admission for surgery (short lead time). This is because there is less available time to provide financial information to patients enabling them to provide IFC in advance of the procedure.

This issue is not as pertinent for those specialists and service providers who discuss in person the available treatment options with a patient, and thus have an opportunity to also provide financial information. However, IFC can be more of an issue for 'downstream' specialists and service providers who have less contact with patients prior to surgery (for example, anaesthetists and surgeon's assistants). Internal polling conducted by the Australian Society of Anaesthetists supports this view. The Australian Society of Anaesthetists (sub. 9) noted that its polling shows that, while 93 per cent of anaesthetists believe they can obtain IFC within five days of treatment, only 25 per cent believe they can obtain IFC when there are only two days between the allocation of the task and the treatment date.

In this framework, emergency admissions can be considered to have no lead time and this makes it very hard for specialists and service providers to obtain IFC. Indeed, as the Australian Health Service Alliance (AHSA) (sub. 1) noted, it may not be appropriate for specialists to obtain IFC if it delays the treatment of an emergency patient.

Health insurance policies

The level of insurance benefit payable can be difficult for patients to ascertain and this can hinder the ability to obtain IFC (Australian Medical Association, sub. DR55). A patient's out-of-pocket expenses are derived from the payable health insurer benefit, in conjunction with treatment charges and the Medicare benefit. Some health insurance policies provide a higher benefit if certain requirements are met, but only the minimum allowable benefit (25 per cent of the Medicare Benefits Schedule fee) if these requirements are not met. These requirements can include the relevant doctor being registered with the fund and accounts being 'correctly' processed. Uncertainty about the level of payable benefit could also make it difficult for the doctor to provide the patient with an accurate estimate of out-of-pocket expenses. Despite these potential issues with estimating likely private health insurance benefits, many specialists do provide indicative private health insurance and Medicare returns to show likely out-of-pocket expenses.

The Australian Society of Anaesthetists (sub. 9) noted that a lack of available benefits schedules can hinder the proper provision of IFC. Health insurers usually update the schedules of their more common 'gap-cover' type insurance policies every November. However, the Australian Society of Anaesthetists suggested that the updated schedules are not always available from the time at which they are activated, and in some cases may even take up to a month to be published. If this were the case, it would make it difficult for practitioners to calculate the expected level of benefit that a patient would receive around this time of the year. The Private Health Insurance Ombudsman stated that they have not received any complaints from medical practitioners or consumers regarding the timely updating of schedules (Private Health Insurance Ombudsman, pers. comm., 28 August 2009).

9.2 Informed financial consent data sources and their suitability

The Australian Government Department of Health and Ageing has commissioned three surveys on IFC in Australia. These were conducted by Ipsos Australia in September 2004, September 2006 and May 2007. The surveys asked patients who had recently made a private health insurance claim for an episode of hospitalisation about the costs they incurred and the information they received about those costs prior to treatment (Ipsos Australia 2005, 2007a, 2008). This is the best available dataset to consider IFC and out-of-pocket expenses in the way stipulated by the terms of reference. However, the surveys have some major limitations that will be discussed below.

Ipsos has also estimated rates of IFC and out-of-pocket expenses for privately insured patients in its biennial report *Ipsos Healthcare and Insurance Australia Report* (Ipsos Australia 2007b) and in a member experience survey for Medibank Private (2009). However, the latter survey was restricted to privately insured patients who were treated in private hospitals.

The Private Health Insurance Administration Council (PHIAC) collects industry data on the out-of-pocket expenses incurred by privately-insured patients. The data include information on 'known-gap' agreements, where:

> … the medical practitioner agrees to accept a payment by the insurer in part satisfaction of the amount owed and the patient has provided informed financial consent so that the gap or out-of-pocket expense to be paid by the insured person is known in advance. (PHIAC 2009a, p. 2)

The provision of IFC is a legal requirement of known-gap agreements and therefore quantification of this segment can provide some information on the provision of IFC. However, it cannot be considered an ideal measure of IFC as there is no verification of whether the provision of IFC actually occurred. Furthermore, this data source can at most be considered a lower bound on the provision of IFC, as it does not include any estimates of IFC where a known-gap agreement is not in place.

Ipsos survey methodology

The samples for the 2004, 2006 and 2007 Ipsos surveys were drawn from individuals who had made a recent insurance claim for hospital treatment as a private patient, and whose claim had been settled prior to 1 September 2004, 15 September 2006 and 1 May 2007 respectively. Each survey involved the distribution of 10 000 questionnaires, with the 2004, 2006 and 2007 surveys receiving a response rate of 41, 46 and 42 per cent respectively. Public hospital episodes and episodes covered by small health insurers were oversampled to improve the accuracy of estimates relating to these groups. The sample population was subsequently weighted so that it was representative of the population.

The Ipsos surveys have a number of limitations that need to be considered when interpreting the results. A potential limitation of the surveys is that individuals may have been more likely to respond if they did not receive sufficient information to provide IFC or incurred significant out-of-pocket expenses. If such sample-selection bias existed, it would result in rates of IFC being underestimated and out-of-pocket expenses being overestimated.

A further limitation is that the surveys are based on patient perceptions and recollections, and are not an audit of actual occurrences. While in hospital, patients may be treated by a number of different practitioners, may receive a large amount of healthcare information and may be worried about a range of other issues aside from treatment costs. All these factors may lead to some patients incorrectly recalling the gap they incurred and whether they provided IFC. Study participant Mark Sinclair (sub. 8) noted that he has had cases as an anaesthetist where he obtained written consent from patients regarding costs, yet was later told that the patient did not realise that they would have out-of-pocket expenses. The Private Health Insurance Ombudsman (sub. 26) also noted that in the investigation of some IFC complaints they have found that IFC was provided by the patient, even though the patient did not later recall this being the case. However, the Private Health Insurance Ombudsman noted that they believe patients recollections to be a ‘good guide’, though not always accurate (Private Health Insurance Ombudsman, sub. 26, p. 5).

The possibility of sample-selection and/or self-reporting bias was tested by comparing Ipsos results with data collected by PHIAC. This PHIAC data, measuring medical gaps, is based on data submitted by health insurers for every hospital admission by a privately-insured patient. The results for 2007 suggest that the Ipsos surveys significantly overestimated the number of services where a gap was paid and the average gap payment (table 9.1).

It is important to distinguish between IFC for individual services and IFC for a patient’s whole episode of hospitalisation. IFC rates for individual services measure the provision of IFC by each service provider or specialist. In contrast, IFC rates for a patient’s whole episode of hospitalisation measure whether IFC is obtained by all individual specialists or service providers by whom a patient is treated in an episode of hospitalisation. As private patients are almost always treated by more than one specialist or service provider in an episode of hospitalisation, the IFC rate for the whole episode of hospitalisation should always be less than the IFC rate for individual services. PHIAC does not publish data on the proportion of patients with no gap for the whole episode of hospitalisation. However, it would be expected that the proportion of patients in the population with no gap in 2007 for the whole episode of hospitalisation was also greater than the figure suggested by the Ipsos survey data.

Table 9.1 **Comparison of Ipsos and PHIAC data, 2007**

	Units	*Ipsos*	*PHIAC*[a]
Share of services with a gap payment[b]	%	28	18
Share of patients with a gap payment (whole episode)[c]	%	42	na
Average gap across all services[b]	$	131	23
Average gap across all services where a gap occurred[b]	$	465	126

[a] PHIAC data is for 2006-07, as it is the closest to the sample period of the 2007 Ipsos survey. [b] This includes all in-hospital services except hospital accommodation. [c] This excludes test-related specialities such as pathology, radiology, ultrasound and x-ray. **na** not available.

Source: Ipsos survey data (unpublished); PHIAC (2007b).

A further limitation of the Ipsos surveys is that the most recent survey was conducted in 2007, and thus the effects of any measures undertaken since 2007 to increase the levels of IFC or to reduce out-of-pocket expenses cannot be assessed.

Due to a lack of other suitable data sources, Ipsos survey data will be the primary data source used to calculate statistics relating to IFC and out-of-pocket expenses in this chapter. However, all results should be considered in light of the aforementioned data limitations.

9.3 Rates of informed financial consent

Reporting rates of informed financial consent

Rather than reporting the proportion of all patients who received sufficient information to provide IFC, this section will define the IFC rate to be the proportion of patients who either had no gap or who received information and provided IFC on any gap for their episode of hospitalisation. This measure of IFC recognises that while patients value receiving information to provide IFC, they also value not incurring any out-of-pocket expenses. This is the measure that is used by Ipsos Australia (2005, 2007a, 2008) in its three reports on IFC.

As previously noted, it is important to distinguish between IFC for individual services and IFC for episodes of hospitalisation. In this chapter the reported IFC rates are based on episodes of hospitalisation that include all of the relevant aspects of the episode (for example, hospital costs, medical costs, surgeon's assistants and prostheses). If IFC is not provided for one (or more) component of the service, then IFC is not provided for the entire episode of hospitalisation. However, IFC rates for individual services can be useful for analysing which specialists or service providers are least likely to obtain IFC. Therefore, the IFC rates used for analysing the provision of IFC for service providers and specialists are for individual services.

Emergency admissions

The Ipsos survey asked respondents whether their admission to hospital was pre-planned or an emergency, with 22 per cent of respondents in 2007 indicating that their admission was the latter.[2]

As previously mentioned, it would be expected that the provision of IFC would be less prevalent for emergency admissions. However, Ipsos data suggests that in 2007, IFC was more likely to have occurred in emergency admissions than in

[2] Ipsos Australia provided no further guidance as to the definition of pre-planned and emergency admissions besides noting that maternity/obstetrics admissions were to be considered pre-planned.

pre-planned admissions (table 9.2). This difference is due to a greater percentage of emergency admissions not incurring any gap payment. When only considering privately-insured patients who incurred a gap, the proportion who provided IFC is nonetheless similar in pre-planned and emergency admissions. While this result is unexpected, any financial information that is provided to a patient in an emergency situation is likely to be different to information provided in a pre-planned context, as the patient may not be in a reasonable position to evaluate their treatment options. For this reason, only pre-planned admissions are considered in the analysis of IFC and out-of-pocket expenses, unless otherwise stated. Specialists who deal with an emergency situation for a patient who had a pre-planned admission cannot be removed from the sample.

Table 9.2 **Informed financial consent rates for pre-planned and emergency admissions, 2007[a]**

	Pre-planned	*Emergency* [b]
	%	%
Informed financial consent	80	88
Informed financial consent (no gap)[b]	54	72
Informed financial consent (gap)	26	16
No informed financial consent	20	12
Total	100	100

a Test-related services are excluded in the calculation of total IFC rates. **b** Ipsos Australia provided no further guidance as to the definition of pre-planned and emergency admissions besides noting that maternity/obstetrics admissions were to be considered pre-planned. **c** This includes patients who were unsure whether they incurred a gap.

Source: Ipsos survey data (unpublished).

Rates of informed financial consent

Ipsos survey data show that, in 2007, the rate of IFC was approximately 80 per cent (table 9.3). Between 2004 and 2007, there was a small increase in the IFC rate, from 78 to 80 per cent.

Table 9.3 **Informed financial consent rates, 2004–2007[a]**

	2004	2006	2007
	%	%	%
Informed financial consent	78	81	80
Informed financial consent (no gap)[b]	52	55	55
Informed financial consent (gap)	25	26	26
No informed financial consent	22	19	20
No informed financial consent for one service[c]	16	14	15
No informed financial consent for multiple services[d]	6	5	5
Total	100	100	100

[a] Only patients who considered their admission to be pre-planned are included. Maternity/obstetrics admissions are considered pre-planned. Test-related services are excluded in the calculation of total IFC rates. [b] This includes patients who were unsure whether they incurred a gap. [c] Patients did not provide IFC to one service provider. [d] Patients did not provide IFC to multiple service providers.

Source: Ipsos survey data (unpublished).

In 2007, of the 20 per cent of admissions where IFC was not provided on all gaps, 15 percentage points involved just one service provider failing to obtain IFC, while 5 percentage points involved more than one service provider failing to obtain IFC.

Informed financial consent rates by type of hospital provider

In 2007, the IFC rate in public hospitals was approximately 88 per cent compared to 80 per cent in private hospitals (table 9.4). This notable difference seems to be primarily attributable to fewer privately-insured patients incurring gaps in public hospitals. Between 2004 and 2007, the ratio of IFC rates between private and public hospitals remained relatively stable.

The proportion of hospital admissions for which IFC was not provided on hospital accommodation costs was 2 per cent or less for both public and private hospitals, suggesting that a lack of IFC for accommodation costs is not an issue for either sector.

Table 9.4 **Informed financial consent rates by hospital provider**[a]

	Private hospitals			*Public hospitals*		
	2004	*2006*	*2007*	*2004*	*2006*	*2007*
	%	%	%	%	%	%
Informed financial consent[b]	77	80	80	85	90	88
IFC (no gap)[c]	51	52	53	67	76	76
IFC (gap)	26	28	27	18	14	12
No informed financial consent	23	20	20	15	10	12
No IFC (medical)[d]	21	19	19	14	9	11
No IFC (accommodation)[d]	2	2	2	1	0	1

[a] Only patients who considered their admission to be pre-planned are included. Maternity/obstetrics admissions are considered pre-planned. Test-related services are excluded in the calculation of total IFC rates. [b] Due to rounding, in 2007 the IFC rate for private hospitals appears not to differ from the overall IFC rate (table 9.3). [c] This includes patients who were unsure whether they incurred a gap. [d] The medical IFC rate and accommodation IFC rate may not sum to the total IFC rate, as some patients may not have provided IFC for both. They may also not equate due to rounding error.

Source: Ipsos survey data (unpublished).

Informed financial consent rates by jurisdiction

There is notable variation in the IFC rates between jurisdictions (table 9.5). In 2007, Tasmania and South Australia had the highest rates of IFC among jurisdictions. In contrast, after excluding the ACT and Northern Territory (due to insufficient sample sizes), New South Wales had the lowest IFC rate. Between 2004 and 2007, the IFC rates did not change significantly for any jurisdictions (figure 9.1).

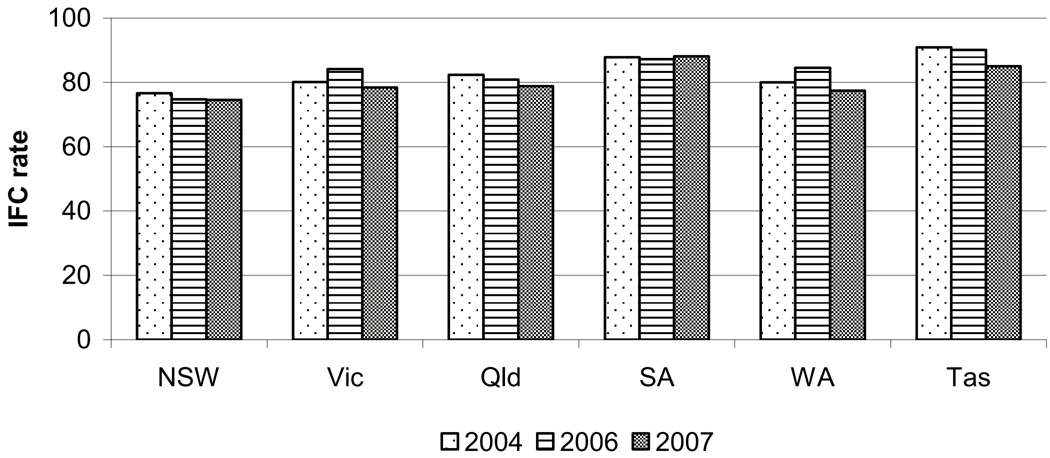
Table 9.5 **Informed financial consent rates by jurisdiction, 2007[a]**

	NSW	*Vic*	*Qld*	*SA*	*WA*	*Tas*
	%	%	%	%	%	%
IFC	77	80	82	88	80	91
IFC (no gap)[b]	53	53	58	63	48	72
IFC (gap)	24	27	25	25	32	18
No IFC	23	20	18	12	20	9
No IFC (medical)[c]	22	18	16	11	17	8
No IFC (accommodation)[c]	2	3	2	1	5	1
No. of observations	1037	889	540	269	287	103

[a] Jurisdiction refers to the patient's jurisdiction of residence. According to the AIHW (2009a) approximately 98 per cent of separations occur in hospitals that are in the patient's jurisdiction of residence. Only patients who considered their admission to be pre-planned are included. Maternity/obstetrics admissions are considered pre-planned. Test-related services are excluded in the calculation of total IFC rates. The sample sizes for the ACT and Northern Territory were very small (52 and 8 observations respectively) and thus are not published. [b] This includes patients who were unsure whether they incurred a gap. [c] The medical IFC rate and accommodation IFC rate may not sum to the total IFC rate, as some patients may not have provided IFC in both. They may also not equate due to rounding error.

Source: Ipsos survey data (unpublished).

Figure 9.1 **Informed financial consent rates by jurisdiction[a]**



[a] Only patients who considered their admission to be pre-planned are included. Maternity/obstetrics admissions are considered pre-planned. Test-related services are excluded in the calculation of total IFC rates.

Source: Ipsos survey data (unpublished).

Informed financial consent rates by location

In 2007, inner regional hospitals had the highest IFC rates (86 per cent), compared to outer regional hospitals (76 per cent) and major city hospitals (80 per cent) (table 9.6). For private hospitals, the IFC rate was notably higher for hospitals located in inner regional areas (85 per cent) compared to outer regional and major city areas (71 and 79 per cent respectively). For public hospitals, the IFC rate was also highest for hospitals located in inner regional areas (95 per cent), however this result was not significantly different from the IFC rate for public hospitals located in outer regional areas.

One possible explanation for these results may be that specialists in inner regional areas have relatively strong community relationships, making it easier to provide financial information to patients. In comparison, patients may be less likely to personally know their specialists in major cities and outer regional areas (possibly because specialists do not reside in the area), making the provision of IFC more difficult.

Between 2004 and 2007, the IFC rate for hospitals located in major cities increased slightly. This was largely due to an improvement in the IFC rate for private hospitals in major cities.

While the improvement in the IFC rate for public hospitals in inner regional areas was significant it was offset by a slight decrease for private hospitals. The changes between 2004 and 2007 for the inner and outer regional areas were not significant.

Table 9.6 **Informed financial consent rates by location and type of provider[a]**

	Major cities			*Inner regional*			*Outer regional*		
	2004	*2006*	*2007*	*2004*	*2006*	*2007*	*2004*	*2006*	*2007*
	%	%	%	%	%	%	%	%	%
Private hospitals	75	79	79	87	88	85	72	77	71
Public hospitals	85	89	85	83	94	95	93	93	89
All hospitals	**76**	**79**	**80**	**87**	**89**	**86**	**80**	**82**	**76**

a Location based on ABS (2005) Australian Standard Geographical Classification. Data for remote and very remote classifications are not published due to insufficient sample sizes. Only patients who considered their admission to be pre-planned are included. Maternity/obstetrics admissions were considered pre-planned. Test-related services are excluded in the calculation of total IFC rates.

Source: Ipsos survey data (unpublished).

Informed financial consent rates by medical specialist

Disaggregating IFC rates by specialist and service providers confirms that a lack of IFC is more commonly associated with medical practitioner charges than with hospital accommodation charges (table 9.7). In 2007, the IFC rate was highest for hospital accommodation (98 per cent) and orthopaedic surgeons (95 per cent). In contrast, the IFC rate was lowest for paediatricians (61 per cent) and test-related services (77 per cent). The IFC rate remained relatively stable across all specialties between 2004 and 2007.

Table 9.7 **Informed financial consent rates by medical practitioner or service provider, 2007[a]**

Medical specialist/service provider	*Sample size*	*Patients that used provider*	*Patients using provider that had a gap*	*IFC rate*
		%	%	%
Paediatrician	226	8	45	61
Tests/pathology/radiology/ ultrasound/x-ray etc.	977	31	24	77
Anaesthetist	2 478	78	30	86
Specialist's or surgeon's assistant	832	24	26	88
General surgeon	530	17	25	92
Oncologist	271	8	15	93
Obstetrician/gynaecologist	440	14	32	94
Cardiologist	200	6	9	94
Orthopaedic surgeon	418	13	45	95
Hospital (accommodation)	3 194	100	5	98

a These results should be interpreted with care as they do not necessarily provide an accurate indication of which specialties have the lowest IFC rates. In particular, the sample sizes in the Ipsos survey for a number of medical specialists or service providers were too small to make robust conclusions about rates of IFC. Only patients who considered their admission to be pre-planned are included. Maternity/obstetrics admissions are considered pre-planned.

Source: Ipsos survey data (unpublished).

When comparing rates of IFC for different service providers, it is important to recognise that it can be more difficult for certain types of specialists to provide sufficient information to enable their patients to give IFC. As mentioned previously, specialists who have less direct contact with patients prior to surgery may find it relatively more difficult to provide IFC. This could explain the lower rates of IFC for anaesthetists, surgeon's assistants and test-related specialists.

Ipsos survey data show that the IFC rates for different specialties are not notably higher for admissions where the patient saw the admitting doctor at least five days prior to the procedure taking place (table 9.8), but rather are broadly similar to the results for the full sample.

Table 9.8 **Informed financial consent rates for patients with a lead time of at least five days, 2007[a]**

Medical specialist/service provider	*Sample size*	*Patients that used provider*	*Patients using provider that had a gap*	*IFC rate*	*Difference from full sample[b]*
		%	%	%	%
Paediatrician	200	10	48	59	-2
Tests/pathology/radiology/ultrasound/x-ray etc	713	33	26	76	-1
Anaesthetist	1 753	80	32	85	-1
Specialist's or surgeon's assistant	622	28	26	88	0
General surgeon	362	17	25	94	2
Oncologist	185	9	16	92	-1
Obstetrician/gynaecologist	358	17	34	94	0
Cardiologist	138	6	9	95	1
Orthopaedic surgeon	317	15	45	95	0
Hospital (accommodation)	2 189	100	5	97	-1

[a] Only patients who saw the admitting doctor at least five days prior to surgery are included. These results should be interpreted with care as they do not necessarily provide an accurate indication of which specialties have the lowest IFC rates. In particular, the sample sizes in the Ipsos survey for a number of medical specialists or service providers were too small to make robust conclusions about rates of IFC. Only patients who considered their admission to be pre-planned are included. Maternity/obstetrics admissions were considered pre-planned. [b] Difference from full sample IFC rates (table 9.7).

Source: Ipsos survey data (unpublished).

9.4 Out-of-pocket expenses

The terms of reference ask the Commission to report the average out-of-pocket expenses for patients who do not receive sufficient information to provide IFC. The Commission has also been asked to report the range (the minimum to maximum) of these costs, and to categorise the data by type of provider (public/private hospital and medical specialty).

As was the case for IFC rates, out-of-pocket expenses are reported for the whole episode of hospitalisation. The exception is that out-of-pocket expenses for individual specialties are reported for individual services. In this context, the average gap with no IFC is defined as the average gap incurred by privately insured patients who do not receive sufficient information to provide IFC for at least one gap.

In particular, as previously noted, results should be considered in light of the limitations of the Ipsos surveys. Estimates regarding the average gap with no IFC should be interpreted with care. This is because disaggregated groups other than private hospitals, New South Wales and Victoria, major city hospitals, hospital accommodation and anaesthetist services have very small sample sizes.

The Ipsos survey data show that in 2007, the overall average gap with no IFC was $847 (table 9.9). This is marginally greater than the average gap incurred by all privately-insured patients that had a gap, but the difference is not significant. In 2007, the out-of-pocket expenses incurred with no IFC ranged from $5 to $19 827.

Table 9.9 **Average gap**[a]

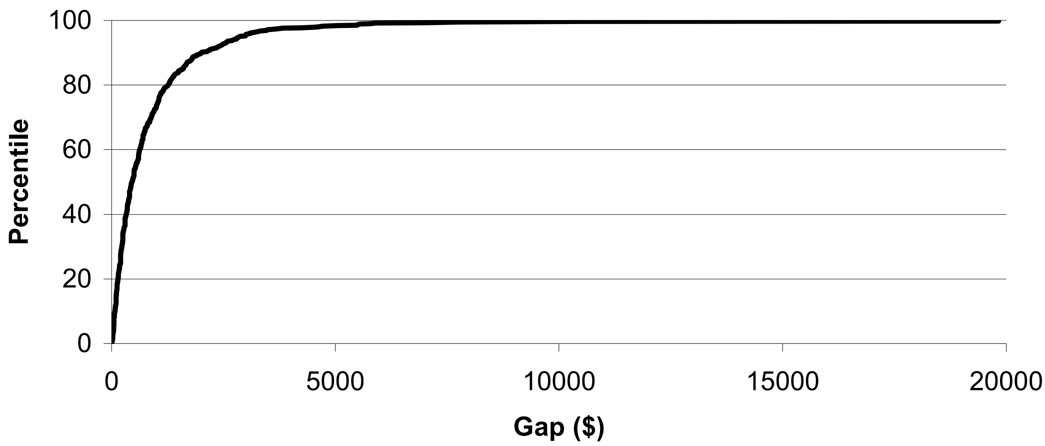
	Units	*2004*	*2006*	*2007*
Proportion of patients incurring a gap	%	48	45	45
Average gap for patients incurring a gap	$	755	684	817
Average gap for patients who did not provide IFC	$	816	756	847
Minimum	$	2	4	5
Maximum	$	8 547	7 881	19 827

[a] Only patients who considered their admission to be pre-planned are included. Maternity/obstetrics admissions are considered pre-planned. Test-related services are excluded in the calculation of average gaps.

Source: Ipsos survey data (unpublished).

Of the gaps where no IFC was provided, approximately 55 per cent were less than $500, approximately 75 per cent were less than $1000, and approximately 90 per cent were less than $2000 (figure 9.2, figure 9.3). Only 2 per cent of gaps with no IFC were greater than $4000. A number of these gaps over $4000 were due to large gaps from specialist's or surgeon's assistants, while for very large gaps one was due to a large gap from a cardiologist and one was due to a large gap for hospital accommodation.

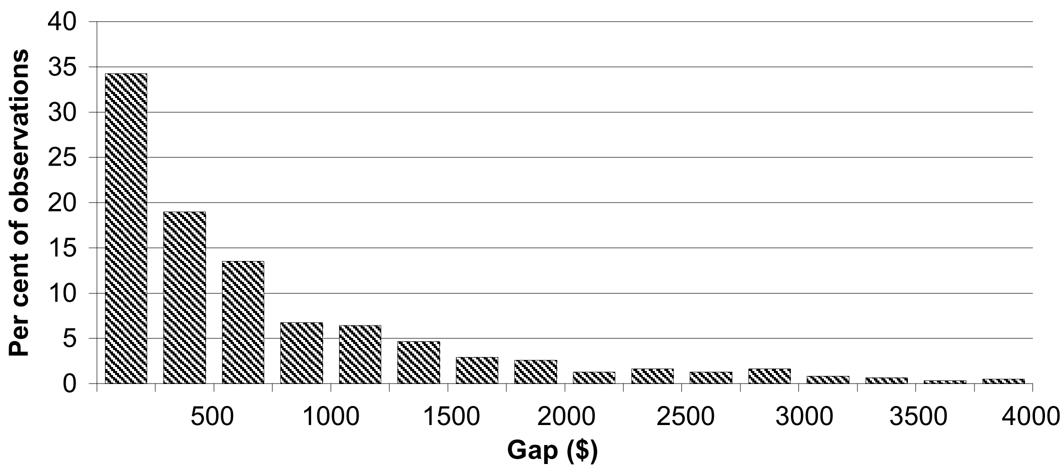
Figure 9.2 **Sample cumulative distribution function of gaps with no IFC, 2007[a]**



[a] Only patients who considered their admission to be pre-planned are included. Maternity/obstetrics admissions were considered pre-planned. Test-related services are excluded in the calculation of average gaps.

Source: Ipsos survey data (unpublished).

Figure 9.3 **Distribution of gaps with no IFC, 2007[a]**



[a] Only patients who considered their admission to be pre-planned are included. Maternity/obstetrics admissions were considered pre-planned. Test-related services are excluded in the calculation of average gaps. Gaps over $4000 are not shown above and represent approximately 2 per cent of observations.

Source: Ipsos survey data (unpublished).

Out-of-pocket expenses by type of hospital provider

The average gap with no IFC was larger for patients in private hospitals ($858) compared to patients in public hospitals ($637) in 2007, however this difference was not statistically significant (table 9.10). In private hospitals, the average gap with no IFC was larger than the average gap for all patients who paid a gap and this difference was statistically significant in 2004 and 2006.

In 2007, the out-of-pocket expenses for patients with no IFC ranged from $6 to $19 827 for patients in private hospitals, compared to a range of $4 to $2030 for patients in public hospitals.

Between 2004 and 2007, the proportion of patients incurring a gap in private hospitals remained relatively stable. However, in public hospitals it fell significantly.

In 2007, the average gap for all patients with a gap was very similar in public hospitals ($788) and private hospitals ($818).

Table 9.10 **Average gap by hospital provider, 2004–2007[a]**

		Private hospitals			*Public hospitals*		
	Units	*2004*	*2006*	*2007*	*2004*	*2006*	*2007*
Proportion of patients experiencing a gap	%	49	48	47	33	24	24
Average gap for patients that had a gap	$	746	689	818	915	575	788
Average gap for patients who did not receive IFC	$	820	768	858	751	536	637
Minimum	$	2	4	6	15	15	4
Maximum	$	8 547	7 881	19 827	4 700	3 400	2 030

a Only patients who considered their admission to be pre-planned are included. Maternity/obstetrics admissions are considered pre-planned. Test-related services are excluded in the calculation of average gaps.

Source: Ipsos survey data (unpublished).

Out-of-pocket expenses by jurisdiction

In 2007, the average gap with no IFC was greatest for patients in New South Wales and Queensland, and smallest for patients in South Australia and Western Australia (table 9.11). In each jurisdiction, the average gap with no IFC was not significantly different from the average gap incurred by all patients experiencing a gap.

Table 9.11 **Average gap by jurisdiction, 2007[a]**

	Units	*NSW*	*Vic*	*Qld*	*SA*	*WA*	*Tas*
Proportion of patients experiencing a gap	%	47	47	42	37	52	28
Average gap for patients that had a gap	$	1 049	682	924	548	512	772
Average gap for patients who did not receive IFC[b]	$	1 052	710	1 040	421	433	930
Minimum	$	6	5	8	25	12	20
Maximum	$	7 050	19 827	10 500	3 100	2 572	5 487

[a] Jurisdiction refers to the patient's jurisdiction of residence. According to the AIHW (2009a) approximately 98 per cent of separations occur in hospitals that are in the patient's jurisdiction of residence. Only patients who considered their admission to be pre-planned are included. Maternity/obstetrics admissions are considered pre-planned. Test-related services are excluded in the calculation of average gaps. The sample sizes for the ACT and the Northern Territory were very small (52 and 8 observations respectively) and thus are not published. [b] These figures are based on very small sample sizes for all jurisdictions aside from New South Wales and Victoria and should be interpreted with care.

Source: Ipsos survey data (unpublished).

Out-of-pocket expenses by location

The average gap with no IFC in 2007 was greatest for patients in hospitals located in major cities, and smallest for patients in hospitals located in outer regional areas (table 9.12). These differences could be because hospitals in major cities undertake more complex procedures, while regional hospitals tend to provide less complex procedures. The difference between the average gap with no IFC and the average gap for all patients who paid a gap was only significantly different for major city hospitals in 2004 and 2006.

Table 9.12 **Average gap by region, 2004–2007[a]**

	Units	Major cities			Inner regional			Outer regional		
		2004	*2006*	*2007*	*2004*	*2006*	*2007*	*2004*	*2006*	*2007*
Proportion of patients experiencing a gap	%	51	48	48	34	33	33	38	36	47
Average gap for patients that had a gap	$	804	716	867	345	461	520	686	497	536
Average gap for patients who did not receive IFC.	$	864	799	901	364	452	581	769	471	440
Minimum	$	2	4	6	4	6	8	40	35	5
Maximum	$	8 547	7 881	19 827	2 082	2 220	2 790	2 400	1 550	1 669

[a] Location based on ABS (2005) Australian Standard Geographical Classification. Data for remote and very remote classifications are not published due to insufficient sample sizes. Only patients who considered their admission to be pre-planned are included. Maternity/obstetrics admissions are considered pre-planned. Test-related services are excluded in the calculation of average gaps.

Source: Ipsos survey data (unpublished).

Out-of-pocket expenses by medical specialist

In 2007, the average gap with no IFC was greatest among patients treated by obstetricians/gynaecologists ($753) and orthopaedic surgeons ($720), and smallest for paediatricians ($197) (table 9.13). However, it is important to remember that almost all these figures are based on small sample sizes and should be interpreted with care.

One possible reason that patients treated by some service providers incur greater out-of-pocket expenses may be that these service providers perform more complex procedures or use more expensive equipment.

The Ipsos data also suggest that between 2004 and 2007, the average gap where no IFC was provided did not change significantly for any speciality.

Table 9.13 **Average gap by medical practitioner or service provider, 2007[a]**

Medical specialist/service provider	*Average gap amount for patients who had a gap*	*Average gap incurred by patients who did not provide IFC*	*Minimum gap incurred by patients who did not provide IFC*	*Maximum gap incurred by patients who did not provide IFC*
	$	$	$	$
Obstetrician/gynaecologist	828	753	39	4 000
Orthopaedic surgeon	841	720	30	2 750
Oncologist	920	677	20	5 600
Cardiologist	633	600	20	19 727
Specialist's or surgeon's assistant	536	461	7	6 000
General surgeon	518	444	12	4 200
Hospital (accommodation)	353	410	1	10 500
Anaesthetist	320	308	4	2 610
Tests/pathology/radiology/ ultrasound/x-ray etc.	287	292	5	4 656
Paediatrician	207	197	16	900

a Gap figures for most specialties are based on small sample sizes and should be interpreted with care. Only patients who considered their admission to be pre-planned are included. Maternity/obstetrics admissions are considered pre-planned.

Source: Ipsos survey data (unpublished).

FINDING 9.1

According to the Private Health Insurance Administration Council, around 90 per cent of hospital services for privately-insured patients do not have out-of-pocket expenses that require informed financial consent. Complaints data collected by the Private Health Insurance Ombudsman suggest that the rate of informed financial consent has been increasing in recent years.

FINDING 9.2

The incidence and average size of out-of-pocket expenses for privately-insured patients appear to be overstated in available survey data collected by Ipsos, due to sample-selection and self-reporting bias. Subject to this qualification, the data suggest that privately-insured patients have a higher rate of informed financial consent and lower out-of-pocket expenses in public hospitals. Few conclusions can be made about out-of-pocket expenses due to small sample sizes.

9.5 Future data improvements

The terms of reference ask the Commission to consider developments that would improve the feasibility of future comparisons. As previously mentioned, the Ipsos survey data have potential limitations of self-selection and reporting bias, which could limit their usefulness in providing information regarding IFC and out-of-pocket expenses. Therefore, future IFC surveys should focus on overcoming these limitations. A robust dataset on IFC would have the following features:

- To address self-selection bias, collection methods would ensure that the sample was representative of all patients who had utilised their private health insurance for hospital visits.
- To address reporting bias, data would not be wholly reliant on patient recollections.

One option would be to include survey questions relating to IFC in the ABS National Health Survey (NHS), as this would remove any self-selection problem and also include self-insured individuals. However, it would still rely on patient recollections and may not consist of enough people with a recent hospital episode. The NHS (ABS 2009b) reports that 53 per cent of the population hold private health insurance. Therefore, if weighting is not considered, the sample of 22 000 people in the NHS would include approximately 12 000 people with private health insurance.

According to PHIAC data the NHS is likely to contain approximately 3800 privately-insured individuals who had a recent episode of hospitalisation, including approximately 500 who were admitted to a public hospital as a private patient.[3] However, to properly analyse the difference in the provision of IFC for public and private hospitals, approximately 1000 public hospital observations would be required. Thus it is unlikely that the NHS would provide a sufficient sample for an analysis of IFC to be conducted.

Another option would be to require privately-insured patients to indicate on their health insurance claim form whether they gave IFC. This information could then be provided to PHIAC and published with information it already releases on out-of-pocket expenses. This option would remove any self-selection bias as all

3 In 2008-09, there were 3 052 375 acute hospital episodes involving privately insured patients, including 435 193 acute public hospital episodes. In 2008-09, there were 9 676 645 individuals privately-insured for hospital treatment (PHIAC 2009b). This calculation does not take into account that some individuals are admitted to hospital more than once in a year. For a sample size similar to the Ipsos surveys, approximately one-third of people with private health insurance would need to have had a recent episode of hospitalisation, which is somewhat unlikely. Furthermore, to properly analyse the difference in the provision of IFC for public and private hospitals, approximately 1000 public hospital observations would be required.

privately-insured patients would complete health insurance claim forms. It would also remove some self-reporting problems, as the length of time between the hospital episode and filling out a claim form would be less than that involved in responding to the Ipsos survey.

Following the release of the Discussion Draft for this study, the Consumers Health Forum (sub. DR59) endorsed this proposal. However, the Australian Medical Association (sub. DR55) and the Australian Government Department of Health and Ageing (sub. DR69) noted that there can be significant time lags between the giving of IFC for the procedure and the submission of an insurance claim form, and thus patients may still forget whether they provided IFC. The Australian Medical Association further noted that in a significant proportion of complaints surrounding a lack of IFC, doctors have documentary evidence of IFC having been provided.

In order to address the problem of patients not accurately recalling their experiences, it might be possible for medical specialists and service providers to include as part of the billing and insurance-claim process an indication of whether documented evidence of IFC is held for the relevant item. This information could in turn be used by PHIAC to monitor rates of IFC.

FINDING 9.3

A more robust future data source on informed financial consent (IFC) could be created by requiring privately-insured patients to indicate on their health insurance claim form whether they provided IFC prior to the procedure. Alternatively, medical specialists and service providers could be required to include as part of the billing and insurance-claim process an indication of whether documented evidence of IFC is held for the relevant item. This information could be collected and reported by the Private Health Insurance Administration Council.

9.6 Best-practice examples of IFC

The terms of reference ask the Commission to identify best-practice examples of where IFC is provided for every procedure. Emphasis is to be put on best-practice examples that occur in specialties where a lack of IFC is most common. The Commission requested examples in the Issues Paper and Discussion Draft but only a limited number of examples were provided.

Table 9.7 suggests that patients are most likely to pay a gap without IFC when using the services of a paediatrician, an anaesthetist, a specialist's or surgeon's assistant or when undergoing diagnostic tests such as pathology, radiology, ultrasound and x-ray. However, as previously mentioned, these results should be interpreted with care as they do not necessarily provide an accurate indication of which specialties have the lowest IFC rates.

In recent years, a number of medical specialist groups have undertaken education campaigns regarding IFC, demonstrating their desire to improve the rates of IFC provision. These included the following campaigns (Australian Medical Association, sub. 28):

- The Australian Medical Association's campaign called 'Let's talk about fees', which provided doctors with materials to read and share with patients.
- The Australian Diagnostic Imaging Association's campaign, which involved the creation of a website where members publish fee information.
- The Australian Society of Anaesthetists' IFC campaign, which included among other initiatives:
  - publishing a newsletter on IFC
  - mailing out an 'IFC campaign kit' to anaesthetists that contained resources on how to improve IFC in anaesthetic practice
  - holding IFC educational meetings for anaesthetists in capital cities and major regional centres.

These education campaigns can be seen to complement the best-practice examples outlined below.

Meditrust

Meditrust is an organisation that helps anaesthetists to provide patients with information prior to their procedure. This information is delivered through a website or toll-free phone number and includes the expected out-of-pocket expenses (box 9.1).

It may be more difficult for anaesthetists than other specialists to obtain IFC from patients. This is because an anaesthetist often needs to make separate contact with the patient aside from the patient's contact with their surgeon, which can be especially difficult when there is a short lead time prior to the procedure. Meditrust's system facilitates this anaesthetist/patient contact and may remove the necessity for a meeting before the day of surgery.

Box 9.1 **Meditrust and IFC**

The Meditrust system provides information to patients in the following way:

- The anaesthetist provides the surgeons with whom they regularly work a note that lists the different procedures specific to that surgeon.
- Any patient to be treated by the anaesthetist receives a copy of the note from the surgeon indicating the procedure they will undergo.
- The patient enters a surgeon-specific password into the Meditrust website.
- Patients select their procedure and private health insurer from lists.
- Patients are presented with information relevant to the anaesthetic for that specific procedure. This includes information relating to:
  - administration of the anaesthetic itself
  - an estimated total fee, the rebate and expected out-of-pocket expenses.
- Patients are provided with the anaesthetist's phone number to contact if they have any questions.
- The anaesthetist receives an email notifying them that the patient has accessed the information and has provided IFC.

Mark Sinclair (an anaesthetist who uses Meditrust) noted in his submission that:

> … patients who are not 'computer literate' and/or do not have Internet access are given a toll-free phone number to ring. A Meditrust staff member asks for the names of the relevant surgeon and anaesthetist, and the information is mailed to the patient as a hard copy, free of charge. (sub. 8, p. 2)

Source: Dr. Mark Sinclair (sub. 8, p. 2)

Sportsmed SA

Sportsmed SA is a South Australian healthcare provider specialising in sports medicine, orthopaedics, podiatry and physiotherapy. Sportsmed SA's hospital admissions only relate to orthopaedic cases.

Aside from emergency admissions that occur on weekends, Sportsmed SA claims that they obtain IFC for all orthopaedic surgeon and hospital accommodation fees. When surgery is recommended for a patient, they are given a 'comprehensive financial quotation for the operation, hospital fees and incidental charges at the time of booking' (Sportsmed SA 2009, p. 11).

Sportsmed SA's hospital is collectively owned by ten orthopaedic surgeons, who have their private practices on site (Sportsmed SA 2009). This collective ownership, coupled with a well functioning administrative process for providing financial information, enables Sportsmed SA to obtain IFC in all cases.

South Australian public hospitals

In South Australia, Rights of Private Practice agreements require that salaried doctors in public hospitals only bill the full Medicare Benefits Schedule fee (SA Department of Health, sub. 4). Therefore, privately-insured patients in public hospitals should not incur any out-of-pocket expenses in relation to treatment performed by salaried doctors. Visiting medical officers are able to sign up to such agreements, but not all do so . These doctors are able to charge as they wish, leaving open the possibility that IFC is not provided on all out-of-pocket expenses in SA public hospitals.

FINDING 9.4

The medical profession has sought to promote best practice for informed financial consent in recent years. This has included educational campaigns for practitioners and internet-based packages to inform consumers of their likely expenses.

10 Indexation of the Medicare Levy Surcharge income thresholds

Key points

- The Medicare Levy Surcharge (MLS) was introduced by the Australian Government in 1997 as part of a suite of measures designed to arrest the decline in private health insurance (PHI) membership, and was first applied for the 1997-98 financial year. The MLS only applies to taxpayers that do not have private patient hospital cover for themselves and all family members.
- The MLS was initially applied at a rate of 1 per cent of taxable income for singles who earned $50 000 or more a year, and to families with one dependent child who earned $100 000 or more a year (with the threshold increasing by $1500 for each dependent child after the first).
- The MLS income thresholds remained unchanged until 2008-09, when the Australian Government lifted the singles threshold to $70 000 a year and the families threshold to $140 000 a year. These amendments also introduced annual indexation of the thresholds.
- The Australian Government lifted the thresholds and introduced indexation to 'refocus the MLS on those with higher income'.
- The terms of reference for this study ask the Commission to advise the Australian Government on the most appropriate indexation factor for the MLS thresholds. The Commission has examined four possible indexation factors: average weekly ordinary time earnings (AWOTE), average weekly total earnings, the consumer price index and the wage price index.
- To assess the merits of these options the Commission estimated and compared the proportion of single and family taxpayers that would have been subject to the MLS, had the thresholds been indexed, between 1999-2000 and 2007-08, by each of the four indexes.
- The Commission found that the proportion of taxpayers subject to the MLS would have increased under all indexation options relative to the proportion of taxpayers subject to the MLS in 1999-2000. However, the proportion of taxpayers subject to the MLS would have increased least if AWOTE was used to index the MLS thresholds.
- The Commission also investigated using an indexation measure based on high income earners, such as the ninth decile of taxable income. This was not practical. Therefore, the Commission suggests that AWOTE is the most appropriate indexation factor, because it is most likely to maintain the Australian Government's goal of keeping the MLS targeted at high income earners.

The terms of reference for this study request advice on the most appropriate indexation factor for the Medicare Levy Surcharge (MLS) income thresholds. The MLS is levied on Australian taxpayers who earn above a specified income threshold and do not have private patient hospital cover for themselves and all family members. This chapter considers four potential indexation factors for the MLS income thresholds.

10.1 Background to the Medicare Levy Surcharge

The MLS was introduced in 1997, and first applied for the 1997-98 financial year, as part of a package of measures designed to stem the decline in private health insurance (PHI) membership in the Australian community, and to maintain the private hospital system as a 'vital complement to the long term viability of Medicare and the public hospital system' (Wooldridge 1997). Other measures included a 30 per cent rebate on PHI premiums (introduced in January 1999) and the Lifetime Health Cover community rating scheme (introduced in July 2000).[1]

The MLS first applied to taxable income in the 1997-98 financial year.[2] It was applied to singles who earned $50 000 or more a year, and to families[3] with one dependent child who earned $100 000 or more a year, if they did not have appropriate private patient hospital cover.[4] For families with more than one

[1] In 2005, the rebate was increased to 35 per cent for people aged 65–69, and to 40 per cent for those aged over 70. The 2009-10 Commonwealth Budget proposed to means test eligibility for the rebate, however legislation giving effect to this proposal is yet to be passed through parliament. The policy, if implemented, would involve the rebate being progressively reduced for higher income ranges, and totally withdrawn for the highest income range. The Lifetime Health Cover rating scheme provides for progressive increases in premiums payable by those taking up PHI after the age of 30.

[2] Taxpayers are defined as people who have a net tax liability greater than zero. Taxable income equals assessable income minus deductions. Income for MLS purposes equals taxable income plus reportable fringe benefits plus the net amount on which family trust distribution tax has been paid, minus any post-June 1983 component of an Employment Termination Payment where the maximum tax rate is zero. The 2008-09 Commonwealth Budget included measures to expand the MLS income definition to include salary-sacrificed superannuation contributions and net losses from financial investments.

[3] For MLS purposes a person is considered to be a member of a family if they contribute to the maintenance of a dependant, including a spouse, even if the spouse has their own income. Any parent (including a sole parent) who contributes to the maintenance of a dependent child or children is considered to be a member of a family.

[4] An appropriate insurance policy for MLS purposes is one that does not have an excess greater than $500 for singles or greater than $1000 for families.

dependent child, the threshold increased by $1500 for each dependent child after the first. The MLS applied at a rate of 1 per cent of all income. The income thresholds set in 1997 remained unadjusted until October 2008.

In 2008, a number of changes were made to the MLS. These included provision for annual increases in the thresholds by means of indexation, and an increase in the income threshold levels, which had remained unchanged since the MLS was introduced for the 1997-98 financial year (box 10.1).

Box 10.1 **Recent changes to the Medicare Levy Surcharge**

Amendments to the Medicare Levy Surcharge (MLS) were passed by Parliament in October 2008, and came into effect for the 2008-09 financial year. The income thresholds at which the MLS became payable in the 2008-09 financial year increased from:

- $50 000 to $70 000 for singles
- $100 000 to $140 000 for couples and families with one dependent child.

The rise in the annual income threshold for families with more than one dependent child remained unchanged at $1500 for each dependent child after the first.

The recent amendments also introduced annual indexation. Average weekly ordinary time earnings (AWOTE) was chosen as the indexation factor. The singles threshold is now indexed annually by multiplying the 2008-09 surcharge threshold by the indexation factor and rounding the result down to the nearest multiple of $1000 (provided that the indexation factor is greater than one). The MLS threshold for couples and families with one dependent child will continue to be set at twice the singles threshold.

The indexation factor is the index number for the quarter ending 31 December in the previous financial year, divided by the index number for the quarter ending 31 December 2006, calculated to three decimal places. The index number used for the December quarter is the estimate of full-time adult AWOTE for the middle month of the quarter (November) that is first published by the ABS.

In the 2009-10 budget, the Australian Government proposed changes that would increase the MLS for high income earners without PHI to:

- 1.25 per cent, for single people earning more than $90 000 and for families (with less than two dependent children) earning more than $180 000
- 1.5 per cent, for single people earning more $120 000 and for families (with less than two dependent children) earning more than $240 000.

Source: *Tax Laws Amendment (Medicare Levy Surcharge Thresholds) Bill (no. 2)* 2008; Treasury (2009a).

There has been extensive discussion regarding the appropriate approach to indexation. While the October 2008 amendments to the MLS provided for indexation of the thresholds on the basis of changes to average weekly ordinary time earnings, the terms of reference for this study request the Commission to advise on the most appropriate indexation factor.

10.2 Why index the MLS thresholds?

When introduced in 1997, the MLS was focused on encouraging ‘high income earners who can afford to take out private health insurance to do so’, and the threshold levels at which the MLS was applied were set accordingly (Wooldridge 1996, p. 8576). When the Australian Government adjusted the MLS income thresholds in the 2008-09 Budget, it indicated that this was done in order to ‘refocus the MLS on those with higher income’ (Treasury 2008b, p. 33).

Without indexation of the income thresholds, an increasing proportion of taxpayers will be subject to the MLS over time, due to a combination of rising real incomes and wage inflation. For example, in 1997-98 around 8 per cent of single taxpayers exceeded the singles threshold. However with no indexation of the MLS thresholds, this proportion increased to approximately 33 per cent of single taxpayers by 2007-08. Therefore, without indexation, more taxpayers become liable for the MLS and the MLS is less effective over time at solely targeting high income earners.

Study participants who commented on the MLS thresholds were generally supportive of indexation, although they expressed a variety of views about the appropriate indexation factor.

10.3 Possible indexation factors

Indexation involves adjusting a dollar amount over time in line with changes in an index, with the index often based on a measure of changes in prices or wages. This is intended to provide an estimate of equivalent dollar amounts over time, adjusting for movements in measured prices or wages.

There are a number of potential price and wage measures that could be used to index the MLS income thresholds. The four measures are:

- average weekly ordinary time earnings (AWOTE)
- average weekly total earnings (AWTE)
- consumer price index (CPI)
- wage price index (WPI) (table 10.1).

Table 10.1 **Possible indexation factors for the Medicare Levy Surcharge**

Indexation factor	*Description*
Average weekly ordinary time earnings (AWOTE)	• Measures growth in average weekly pre-tax earnings from standard hours of full-time work for adult wage and salary earners. • Includes award, workplace and enterprise bargaining payments, penalty payments, shift allowances, commissions and retainers, bonuses, incentives, profit sharing payments, workers compensation and salary payments to directors. • Excludes amounts that are salary sacrificed, non-cash components of salary packages, overtime payments, retrospective pay, pay in advance, leave loadings, severance, termination and redundancy payments and other sources of income such as capital gains. • Does not cover a number of workers, including self-employed persons and owners of unincorporated businesses. • Index varies not only with changes in wage levels but also according to changes in average hours worked and composition of the workforce.
Average weekly total earnings	• Includes both AWOTE and overtime earnings.
Consumer price index	• Measures change over time in the price of a specified 'basket' of goods and services, which comprise a high proportion of household expenditures.
Wage price index	• Measures change over time in wages paid for a fixed amount of labour. • Controls for changes in income levels resulting from increases in hours worked, or changes in the composition of the workforce. • Does not cover other sources of income such as capital gains.

Source: ABS (*Average Weekly Earnings, Australia*, Cat. no. 6302.0; *Consumer Price Index, Australia*, Cat. no. 6401.0; *Labour Price Index, Australia*, Cat. no. 6345.0).

The key differences between these measures are that:

- AWOTE and AWTE both measure pre-tax weekly earnings but AWOTE includes standard hours of full-time work and AWTE includes overtime.
- WPI measures the change over time in wages paid for a fixed amount of labour and controls for changes in hours worked and the composition of the workforce.
- CPI does not measure earnings. It measures changes in a group of commonly-purchased household items.

These are all published approximately two months after the end of the quarter making each a practical option for indexing the MLS thresholds.

Study participants expressed a range of views on the most appropriate indexation factor for the MLS. The Australian Nursing Federation (sub. 17; DR57) supported AWOTE or AWTE being used, noting that these measures most accurately reflect changes in earnings. The Australian Government Department of Health and Ageing (DOHA) (sub. 32; DR69) also supported AWOTE being used as an indexation factor for the MLS thresholds, noting that it is most relevant because it measures the 'normal' earnings of workers (since it excludes overtime).

Access Economics (sub. DR60) and the Australian Medical Association (sub. 28) preferred the WPI. The Australian Medical Association observed that:

> [O]ther measures of earnings, such as survey-based AWE [Average Weekly Earnings] and AWOTE, are affected significantly by changes in the composition of employment. As such, the trends in AWOTE bear little relation to the experience of the typical householder. (sub. 28, p. 7)

Following the release of the Discussion Draft for this study, the Australian Medical Association (sub. DR55) also suggested the national accounts measure of average earnings — average non-farm compensation per employee — that is published by the ABS (2009a). This measure includes compensation in the form of in-kind benefits and employer contributions to superannuation and workers compensation, in conjunction with wages and salaries paid in cash. However, given that the MLS is only calculated on the basis of taxable income, this measure does not seem suitable.

The Royal Australasian College of Surgeons (sub. 30, p. 4) noted that 'the public understanding of CPI makes it the appropriate indexation methodology'. The Australian Health Insurance Association also argued in favour of the CPI because it is used to index other thresholds and payment levels:

> The use of the CPI would ensure a consistent policy approach to the adjustment of Australian Government health and welfare thresholds and payments, as the CPI is also used to adjust:
>
> - the Medicare Levy Low Income threshold;
> - the Medicare Safety Net;
> - the PBS Safety Net;
> - the Baby Bonus; and
> - Family Tax Benefits A and B. (sub. 18, p. 10)

However, not all government thresholds and payments are indexed by the CPI. As noted by DOHA:

> AWOTE is the indexation measure used for a number of other income thresholds (e.g., the concessional superannuation contributions cap and the low-rate threshold for superannuation lump sum payments). (sub. 32, p. 26)

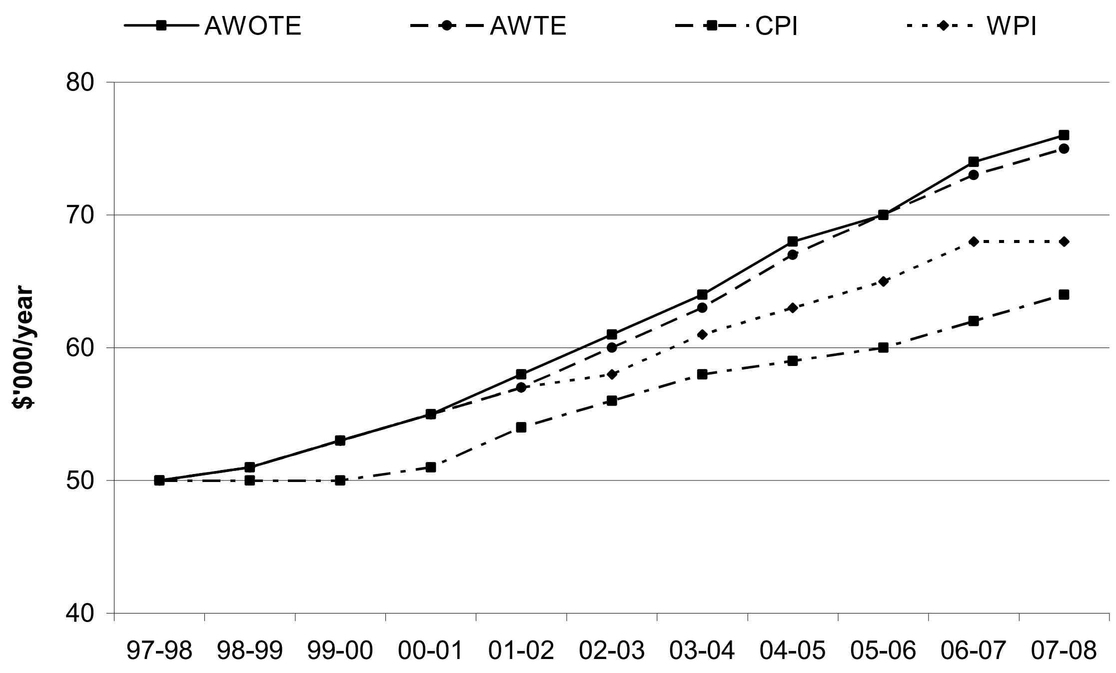
In addition, it is important that the MLS indexation factor tracks taxable income over time, given the goal of keeping the MLS targeted at high income earners. As noted by Catholic Health Australia (sub. 20, p. 2):

> It is important that whatever index is chosen, it provides a reasonable representation of movements in income levels.

10.4 Assessment of potential indexation factors

To assess potential indexation factors, the Commission examined what the MLS income thresholds *would* have been if indexed between 1997-98 and 2007-08 by one of the four measures outlined above. Historically, the CPI has increased at a slower rate than wages and so it would have led to the lowest thresholds between 1997-98 and 2007-08. If the singles threshold had been indexed by AWOTE or AWTE from 1997-98 to 2007-08, it would have been around 17 per cent higher in 2007-08 than if it had been indexed by the CPI (figure 10.1).

Figure 10.1 **MLS income thresholds if there had been indexation, singles[a]**



[a] Data for WPI are only available from August 1997. Therefore, an indexation factor for 1998-99 could not be calculated. The hypothetical WPI thresholds were indexed instead by AWOTE for this year because it is also a wage measure.

Source: ABS (*Average Weekly Earnings, Australia*, Cat. no. 6302.0; *Consumer Price Index, Australia*, Cat. no. 6401.0; *Labour Price Index, Australia*, Cat. no. 6345.0), Productivity Commission estimates.

Using these hypothetical thresholds and data on the distribution of income, the Commission calculated the proportion of single taxpayers and family taxpayers who would have been subject to the MLS had indexation occurred.

If the MLS singles threshold had been indexed, the threshold would, in 2007-08, have been $77 000 (with AWOTE indexation), $76 000 (AWTE), $65 000 (CPI) and $69 000 (WPI). Similarly, if the MLS families threshold had been indexed, the threshold for families would, in 2007-08, have been $154 000 (with AWOTE), $152 000 (AWTE), $130 000 (CPI) and $138 000 (WPI).

To ensure the MLS remains focused on high income earners, the indexation factor used needs to be commensurate with the changes in their income. The Commission used data on the distribution of income to estimate the proportion of taxpayers who would have had incomes above the MLS income thresholds under each of the four indexation options from 1999-2000 to 2007-08, (box 10.2).

Box 10.2 **Income distribution data used in MLS analysis**

The Commission obtained data from the Australian Government Department of the Treasury on the distribution of income used from 1999-2000 to 2005-06, based on confidentialised sample unit record data extracted by the Australian Taxation Office (ATO). These samples have typically been extracted on an annual basis shortly after the publication of *Taxation Statistics.*

In the period after the sample data extraction, some tax returns continue to be lodged by 'late lodgers'. Therefore, the aggregate number of taxpayers is likely to be greater than estimated using the relevant sample data.

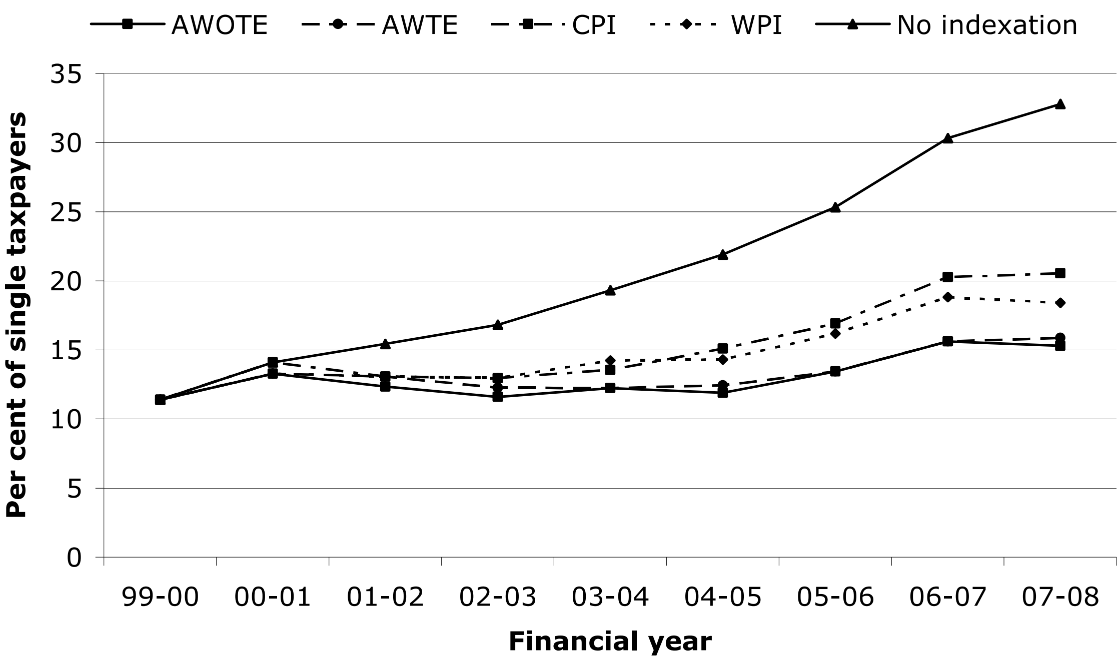
For the years 2006-07 and 2007-08, the analysis is based on data recently provided to the Treasury by the ATO. The data for 2007-08 may not be complete. However, due to the Tax Bonus, the number of returns processed for 2007-08 in a 12-month period exceeds what would be expected in a normal year.

Consistent data for the years 1997-98 and 1998-99 were not available.

If the MLS singles threshold had been indexed between 1999-2000 and 2007-08, the proportion of single taxpayers subject to the MLS would have been most stable had AWOTE been used (figure 10.2). Therefore, indexing the MLS by AWOTE would have gone closest to achieving the Australian Government's objective of keeping the MLS focused on high income earners among singles.

Nevertheless, even with AWOTE indexation, the proportion of single taxpayers that would have been subject to the MLS would have increased from 11.4 to 15.3 per cent between 1999-2000 and 2007-08.

Figure 10.2 **Proportion of single taxpayers subject to the MLS under alternative indexation options**



Source: Australian Government Department of the Treasury (unpublished); ABS (*Average Weekly Earnings, Australia*, Cat. no. 6302.0; *Consumer Price Index, Australia*, Cat. no. 6401.0; *Labour Price Index, Australia*, Cat. no. 6345.0); Productivity Commission estimates.

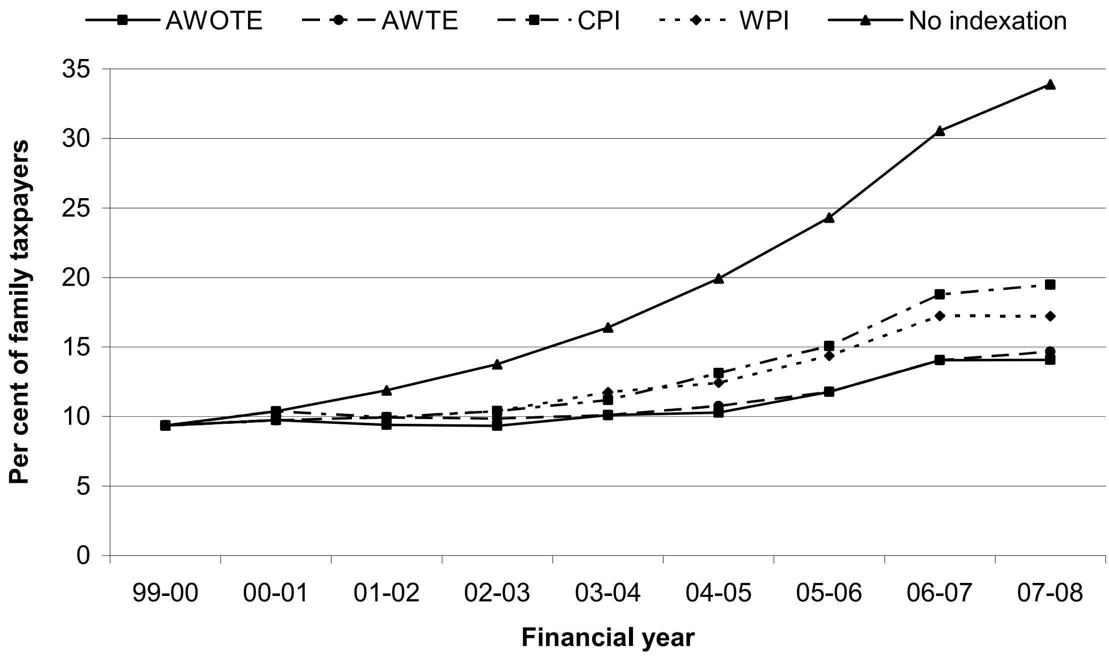
In contrast, the proportion of single taxpayers subject to the MLS would have increased significantly if the CPI (from 11.4 to 20.5 per cent) or WPI (from 11.4 to 18.4 per cent) were used. Therefore, the CPI and WPI are clearly unsuitable if the intention of the Government is for the MLS to target high income earners among singles.

If AWTE had been used, a slightly higher proportion of single taxpayers would have been subject to the MLS in some years than if AWOTE had been used.

Given that no indexation actually took place between 1999-2000 and 2007-08, 33 per cent of single taxpayers were potentially subject to the MLS in 2007-08.

As discussed above, when the MLS was introduced, the threshold for families was set at twice the singles threshold. If the MLS families threshold had been indexed, between 1999-2000 and 2007-08, the proportion of families subject to the MLS would have been most stable had AWOTE been used (figure 10.3). Therefore, indexing the MLS income thresholds by AWOTE would also have best met the Australian Government's objective of keeping the MLS focused on high income earners of families.

Figure 10.3 **Proportion of taxpayers who were members of a family subject to the MLS under alternative indexation options[a]**



[a] For purposes of simplicity, the $1500 threshold increase for a second and each additional child is not taken into account in this analysis. Therefore, these estimates slightly overstate the proportion of family taxpayers who would have been subject to the MLS.

Source: Australian Government Department of the Treasury (unpublished); ABS *Source*: ABS (*Average Weekly Earnings, Australia*, Cat. no. 6302.0; *Consumer Price Index, Australia*, Cat. no. 6401.0; *Labour Price Index, Australia*, Cat. no. 6345.0); Productivity Commission estimates.

Nevertheless, with AWOTE, the proportion of family taxpayers that would have been subject to the MLS would still have increased, from 9.4 per cent in 1999-2000 to 14.1 per cent in 2007-08.

The proportion of family taxpayers subject to the MLS would have increased by much more had the CPI (from 9.4 to 19.5 per cent) or WPI (from 9.4 to 17.2 per cent) been used as the indexation factor. Hence the CPI and WPI are unsuitable if the intention of the Government is for the MLS to target high income families.

If AWTE had been used, a slightly higher proportion of family taxpayers would have been subject to the MLS in some years than if AWOTE had been used.

The analysis in this chapter shows that if the MLS income thresholds had been indexed, the proportion of single and family taxpayers subject to the MLS would each have increased even if AWOTE had been used. The other indexation factors would have had led to more people being within the scope of the MLS.

The Government's objective is for the MLS to target high income earners. But the four indexation options examined above would not have held the proportion of taxpayers subject to the MLS constant.

The Commission investigated using an indexation factor that specifically measured income changes for high income earners, rather than average earnings. Since 8 per cent of single taxpayers were subject to the MLS when it was introduced, the Commission considered the feasibility of indexing the thresholds based on movement in the ninth decile (ninetieth percentile) of incomes for singles.[5] The Commission could not find data published annually by income decile. Thus, at this point in time this option is not feasible. However, this option could be considered in the future if data were available in a robust and timely manner.

In light of the above, the Commission considers that AWOTE is the most appropriate indexation factor for the MLS thresholds, and is more likely to meet the Australian Government's goal of the MLS being targeted at high income earners than if other indexation factors were used.

FINDING 10.1

Average weekly ordinary time earnings is the most appropriate indexation factor for the Medicare Levy Surcharge income thresholds.

5 An alternative option would be to index the thresholds based on movements in the eighty-fifth percentile of incomes for singles, as around 85 per cent of single taxpayers were below the MLS income threshold for singles after it was increased in 2008-09.

A Public consultation

Table A.1 Submissions received

Participant	*Submission number*[a]
ACT Health	DR52
Access Economics	DR60
Australasian College for Emergency Medicine	14
Australian and New Zealand College of Anaesthetists	11
Australian Commission on Safety and Quality in Health Care	24
Australian Council on Healthcare Standards	13#
Australian Government Department of Health and Ageing	DR69, 32
Australian Health Insurance Association	DR58, 18
Australian Health Service Alliance	DR53, 1
Australian Healthcare and Hospitals Association	33
Australian Medical Association	DR55, 28
Australian Nursing Federation	DR57, 17
Australian Private Hospitals Association	DR71, 25#
Australian Society of Anaesthetists	9
Australian Unity	31
Becton Dickinson	29
Bio21 Australia Limited	35
Catholic Health Australia	DR62, 20
Centre for Health Communication, UTS	3
Centre for Health Economics, Monash University	7
Centre for Health Economic Research and Evaluation, UTS	DR68
Children's Hospitals Australasia	21#
Cochrane Consumer Network	DR47
Consumers Health Forum *in Australia*	DR59
Croakey	2#
Dr. John Deeble AO	DR56
Department of Health, Government of Western Australia	DR72
Doctors Reform Society of Australia	DR50
Epworth Healthcare	DR70
Flinders University – Centre for Clinical Change	10#
Gerry Carton Consulting Pty Ltd	12

(Continued next page)

Table A.1 (Continued)

Participant	*Submission number*[a]
Grattan Institute	DR66
Hanlon, Mark	DR46
Harper, Richard	6
Health Services Association of New South Wales	DR54
Health Services Union	DR63
Healthcare Associated Infection Unit, Communicable Disease Control Directorate, Department of Health WA	38
Healthscope Limited	DR67, 42*
Health Services Association of NSW Branch	DR54
Medical Technology Association of Australia	DR48
Melbourne Institute of Applied Economic & Social Research, University of Melbourne	16
National Coalition of Public Pathology	DR49
NSW Department of Health	40, 41
NSW Health Surgical Services Taskforce	DR43
Pharmaceutical Society of Australia	19
Private Cancer Physicians of Australian and Haematology and Oncology Clinics of Australia	36
Private Health Insurance Intermediaries Association	5
Private Health Insurance Ombudsman	26
Queensland Health	27
Queensland Nurses' Union	DR51
Repatriation Commission	39
Rhonda Kerr and Associates, Health Facility Planning	DR44, 34
Royal Australasian College of Surgeons	30#
Royal College of Pathologists of Australasia	23
SA Department of Health	DR45, 4
Sinclair, Mark	8#
Tasmanian Department of Health and Human Services	DR61, 37#
UnitingCare Health	16

[a] A hash (#) indicates the submission includes attachments. An asterix (*) indicates the submission is 'In Confidence'.

Table A.2 **Visits**

Participant (grouped by visit location)
Canberra
Australian Bureau of Statistics
Australian Centre for Economic Research on Health
Australian Health Insurance Association
Australian Healthcare and Hospitals Association
Australian Institute of Health and Welfare
Australian Medical Association
Australian Private Hospitals Association
Catholic Health Australia
Department of Health and Ageing (Australian Government)
Department of Veterans’ Affairs (Australian Government)
Women’s and Children’s Hospitals Australasia
Melbourne
Australian Health Service Alliance
Australian Society of Anaesthetists
Business Council of Australia
Centre for Health Economics, Monash University
Harper, Richard
Health Insurance Restricted Membership Association of Australia
Healthscope Limited
Medibank Private
Victorian Department of Human Services
Visasys
Sydney
Australian Commission on Safety and Quality in Health Care
NSW Department of Health
Ramsay Health Care

Table A.3 **Participants in initial roundtable**

Canberra 30 June 2009
ACT Department of Health
Australian Bureau of Statistics
Australian Centre for Economic Research on Health
Australian Commission on Safety and Quality in Health Care
Australian Council on Healthcare Standards
Australian Health Insurance Association
Australian Health Service Alliance
Australian Healthcare and Hospitals Association
Australian Institute of Health and Welfare
Australian Medical Association
Australian Nursing Federation
Australian Private Hospitals Association
Catholic Health Australia
Centre for Health Economics Research and Evaluation
Consumers’ Health Forum
Department of Health and Ageing (Australian Government)
Department of Veterans’ Affairs (Australian Government)
Healthscope Limited
Queensland Health
Ramsay Health Care
SA Department of Health
Tasmanian Department of Health and Human Services
Victorian Department of Human Services
WA Department of Health

Table A.4 **Participants in Discussion Draft roundtable**

Canberra 22 October 2009
ACT Department of Health
Australian Bureau of Statistics
Australian Council on Healthcare Standards
Australian Commission on Safety and Quality in Health Care
Australian Healthcare and Hospitals Association
Australian Health Insurance Association
Australian Health Service Alliance
Australian Institute of Health and Welfare
Australian Medical Association
Australian Nursing Federation
Australian Private Hospitals Association
Catholic Health Australia
Centre for Health Economics Research and Evaluation
Consumers' Health Forum
Department of Health (Government of Western Australia)
Department of Health and Ageing (Australian Government)
Department of Health and Families (NT Government)
Healthscope Limited
NSW Department of Health
Queensland Health Department
Ramsay Health Care
SA Department of Health
Tasmania Department of Health and Human Services
Victorian Department of Human Services

Table A.5 **Teleconference participants**

17 September 2009 (Hospital and medical costs)
ACT Department of Health
Catholic Negotiating Alliance
Department of Health and Ageing (Australian Government)
Healthscope Limited
Mater Health Services
Mercy Health and Aged Care
NSW Department of Health
NT Department of Health and Families
Queensland Health
SA Department of Health
St Andrew's Hospital
Tasmanian Department of Health and Human Services
UnitingCare Health
Victorian Department of Health
WA Department of Health
23 November 2009 (Multivariate analysis)
Australian Health Insurance Association
Australian Health Service Alliance
Australian Institute of Health and Welfare
Australian Private Hospitals Association
Catholic Health Australia
Department of Health and Ageing (Australian Government)
Healthscope Limited
NSW Department of Health
Queensland Health
SA Department of Health
Victorian Department of Health
WA Department of Health

B National Healthcare Agreement performance indicators

The National Healthcare Agreement (NHA) is one of six national agreements incorporated in the current Intergovernmental Agreement on Federal Financial Relations (box B.1) (COAG 2008c). The NHA provides governments with a structure for the funding and delivery of services across the health sector. It defines the respective roles and responsibilities of the Australian and state and territory Governments, and sets out mutually agreed objectives and outcomes for the sector. Monitoring and reporting of government performance against agreed outcomes and benchmarks will be conducted using a set of performance indicators designed for that purpose.

B.1 The National Healthcare Agreement

The NHA had its origins in the 20 December 2007 meeting of the Council of Australian Governments (COAG). COAG agreed to commence a program of substantive reform in order to increase productivity, address emerging inflationary pressures and improve the quality of services delivered to the Australian community. Health and ageing was one of seven areas identified for reform.

The National Health and Hospitals Reform Commission (NHHRC) was established in February 2008 to support reform in the area of health and ageing. Terms of reference provided to the NHHRC included provision of advice on a framework for the next Australian Health Care Agreements (AHCAs), and development of a long-term health reform plan (COAG 2007; NHHRC 2008, 2009).

While previous AHCAs were bilateral agreements between the Australian Government and each state and territory, the current NHA is a single agreement between the Australian and all state and territory governments. It took effect 1 July 2009 and will be reviewed every four to five years, commencing midway through the first four to five year period (COAG 2008d).

Box B.1 **National Agreement Reporting**

In November 2008, the Council of Australian Governments (COAG) endorsed a new Intergovernmental Agreement on Federal Financial Relations (IGA) (2008b). The IGA provides 'an overarching framework for the Commonwealth's financial relations with the States and Territories'. In addition, the IGA sets out 'roles and responsibilities of each level of government and an improved focus on accountability for better outcomes and better service delivery'.

The six National Agreements incorporated in the IGA are the:

- National Healthcare Agreement
- National Education Agreement
- National Agreement for Skills and Workforce Development
- National Affordable Housing Agreement
- National Disability Agreement
- National Indigenous Reform Agreement.

Each National Agreement contains objectives, outcomes, outputs and performance indicators for the sector, as well as performance benchmarks, policy directions and priority reform areas. National Agreements also set out the respective roles and responsibilities of the Australian and state and territory governments in the delivery of services. The performance of all governments in achieving mutually agreed outcomes and benchmarks will be monitored and assessed by the COAG Reform Council and reported publicly on an annual basis.

National Partnerships (NPs) are another form of agreement that fund specific projects and facilitate and/or reward states and territories that deliver on nationally significant reforms. They are bilateral agreements between the Australian and individual state and territory governments. NPs that relate to the health sector include the National Partnership Agreement on Hospital and Health Workforce Reform, the National Partnership Agreement on Preventive Health and the National Partnership Agreement on Closing the Gap in Indigenous Health Outcomes.

Source: COAG (2008c).

The NHA has the overarching objective 'to improve health outcomes for all Australians and the sustainability of the Australian health system' (COAG 2008d). Developed in the context of growing challenges to the sustainable provision of healthcare, it recognises the need for reform of the health sector as a whole in order to achieve this objective. Challenges include access to services, the growing burden of chronic disease, population ageing and escalating costs associated with new health technologies (COAG 2007; NHHRC 2008, 2009).

Unlike previous agreements, which focused exclusively on public hospitals, the NHA extends across preventative, primary, sub-acute, acute and aged care, and is intended to incorporate private sector services where relevant (COAG 2008d; DOHA 2009f). It directly addresses issues of inequitable access to healthcare for Indigenous Australians, residents of rural and remote areas and the socioeconomically disadvantaged. The NHA is also designed to address concerns about the long-term sustainability of the health system.

In another departure from previous agreements, the NHA addresses issues of governance. It clarifies roles and responsibilities of the Australian and state and territory governments in delivering health services. It sets out mutually agreed objectives and intended outcomes across the continuum of care, and specifies policy directions and reform areas that governments have undertaken to prioritise. The comparative performance of governments in achieving objectives and outcomes will be monitored and assessed against agreed progress and output indicators.

The NHA is organised around agreed long-term objectives in seven areas, one of which is 'hospital and related care' (table B.1). Intended outcomes and associated performance indicators (progress measures and outputs) are set out for each of the objectives (table B.2). This structure recognises that, while hospitals are integral to a comprehensive healthcare system, they do not operate in isolation from other parts of the health sector (NHHRC 2008, 2009). Hospital performance is affected not only by internal activities, but also by the performance of, and interaction between, acute, sub-acute and primary healthcare services.

Table B.1 **Objectives of the National Healthcare Agreement**

Area	*Long-term objectives*
Prevention	Australians are born and remain healthy.
Primary and Community Health	Australians receive appropriate high quality and affordable primary and community health services.
Hospital and Related Care	Australians receive high quality hospital and hospital-related care that is appropriate and timely.
Aged Care	Older Australians receive appropriate high quality and affordable health and aged care services.
Patient Experience	Australians have positive health and aged care experiences which take account of individual circumstances and care needs.
Social Inclusion and Indigenous Health	Australia's health system promotes social inclusion and reduces disadvantage, especially for Indigenous Australians.
Sustainability	Australians have a sustainable health system.

Source: COAG (2008d).

Table B.2 **National Healthcare Agreement Reporting Structure**

Outcome	*Progress measure*	*Output*
Prevention		
Children are born and remain healthy. Australians have access to the support, care and education they need to make healthy choices. Australians manage the key risk factors that contribute to ill health.	Proportion of babies born with low birth weight. Incidence/prevalence of important preventable diseases. Risk factor prevalence.	Immunisation rates for vaccines in the national schedule. Cancer screening rates (breast, cervical, bowel). Proportion of children with fourth year developmental health check.
Primary and community health		
The primary healthcare needs of all Australians are met effectively through timely and quality care in the community. People with complex care needs can access comprehensive, integrated and coordinated services.	Access to general practitioners, dental and other primary healthcare professionals. Proportion of diabetics with HbA1c below 7 per cent. Life expectancy (including the gap between Indigenous and non-Indigenous). Infant/young child mortality rate (including the gap between Indigenous and non-Indigenous). Potentially avoidable deaths. Treated prevalence rates for mental illness. Selected potentially preventable hospitalisations. Selected potentially avoidable general practitioner type presentations to emergency departments.	Number of primary care services per 1000 population (by location). Number of mental health services. Proportion of people with selected chronic disease whose care is planned (asthma, diabetes, mental health). Number of women with at least one antenatal visit in the first trimester of pregnancy.
Hospital and related care		
Australians receive high quality hospital and hospital-related care that is appropriate and timely.	Waiting times for services. Selected adverse events. Unplanned/unexpected readmissions. Survival of people diagnosed with cancer.	Rates of services provided by public and private hospitals.

(Continued on next page)

Table B.2 (continued)

Outcome	*Progress measure*	*Output*
Aged care		
Older Australians receive high quality, affordable health and aged care services that are appropriate to their needs and enable choice and seamless, timely transitions within and across sectors.	Residential and community aged care services per 1000 population aged 70+ years. Selected adverse events in residential care.	Number of older people receiving aged care services by type (in the community and residential settings). Number of aged care assessments conducted. Number of younger people with disabilities using residential, Community Aged Care Package and Extended Aged Care at Home services. Number of people 65+ receiving sub-acute and rehabilitation services. Number of hospital patient days by those eligible and waiting for residential aged care.
Patient experience		
All Australians experience best practice care suited to their needs and circumstances informed by high quality health information. Patients experience seamless and safe care when transferring between settings.	Nationally comparative information that indicates levels of patient satisfaction around key aspects of care they received.	
Social inclusion and Indigenous health		
Indigenous Australians and those living in rural and remote areas or on low incomes achieve health outcomes comparable to the broader population.	Age standardised mortality. Access to services by type of service compared to need. Teenage birth rate. Hospitalisation for injury and poisoning. Children's hearing loss.	Indigenous Australians in the health workforce.
Sustainability		
Australians have a sustainable health system that can respond and adapt to future needs.	Net growth in health workforce (doctors, nurses, midwives, dental practitioners, pharmacists). Allocation of health and aged-care expenditure. Cost per casemix-adjusted separation for both acute and non-acute care episodes.	Number of accredited or filled clinical training positions.

Source: COAG (2008d).

The NHA sets out agreed performance benchmarks against three aspects of 'hospital and related care' (COAG 2008d) that, along with performance indicators, will be considered in assessment of the comparative performance of governments against the NHA. These aspects are:

- administration — within five years implement a nationally-consistent approach to activity-based funding for public hospital services, which also reflects the community service obligations for small and regional hospital services
- emergency departments — 80 per cent of emergency department presentations are seen within clinically recommended triage times as recommended by the Australasian College for Emergency Medicine by 2012-13
- quality and safety — the rate of *Staphylococcus aureus* (including Methicillin-resistant *Staphylococcus aureus* (MRSA)) bacteraemia is no more than 2 per 10 000 occupied bed days for acute care public hospitals by 2011-12 in each state and territory.

B.2 Monitoring and reporting

The COAG Reform Council (CRC) will monitor and assess government performance in relation to the agreed objectives, outcomes, outputs and performance benchmarks. Performance will be reported publicly on an annual basis, commencing with the 2008-09 financial year. Data will be provided to the CRC by the Steering Committee for the Review of Government Service Provision (COAG 2008c).

Hospital and related care

Under the NHA, and like the AHCAs, public hospital funding is the joint responsibility of Australian and state and territory governments. States and territories are responsible for providing health and emergency services through the public hospital system. These services are to be accessible to all eligible Australians free of charge, within clinically appropriate periods, on the basis of clinical need. States and territories also have responsibility for ensuring that those who elect to be treated as private patients in public hospitals do so on the basis of informed financial consent (COAG 2008d).

Governments have agreed to particular policy directions and priority areas for reform in order to achieve the agreed outcomes and objectives (COAG 2008d). In relation to 'hospital and related care', the long-term objective is for 'Australians [to] receive appropriate high quality and affordable hospital and hospital-related care'. Related policy directions and priority areas for reform are provided in box B.2.

Box B.2 **Policy directions and priority reform areas**

The following policy directions and priority reform areas have been agreed by the Australian, state and territory governments. They include those specified against the 'hospital and related care' objective, as well as those specified under other objectives but related to hospital performance.

Hospital and related care

Agreed policy directions include:

- reduce elective surgery and emergency department waiting times
- increase technical efficiency of public hospital services
- improve safety and quality of care, and patient access to performance information
- more effective assessment and support of patients before admission to, and on discharge from, acute-care settings.

Agreed priority areas for reform include:

- develop nationally consistent activity-based funding for public hospital services
- implement improvements in hospital quality and safety
- increase the proportion of elective surgery patients treated within clinically recommended waiting times
- improve access to rehabilitation, post-acute and transition care services
- improve assessment of relative performance of public and private hospitals
- improve quality of data on non-admitted patient services
- improve levels of informed financial consent for private patients in public and private hospitals.

Areas other than hospital and related care

Agreed policy directions for each target area are:

- aged care — provide continuity of care across hospitals, community and aged care
- sustainability — reward allocative efficiency across preventative, primary, acute, sub-acute, rehabilitation and aged care services.

(Continued on next page)

Box B.2 (continued)

Agreed priority areas for reform for each target area are:

- aged care — provide older patients in hospitals with timely access to appropriate sub-acute care, including rehabilitation
- sustainability — move to a proper long-term share of Commonwealth funding for the public hospital system.

Source: COAG (2008d).

Performance indicators

Performance indicators to be reported under the NHA largely reflect the agreed policy directions and priority reform areas. 'Hospital and related care' performance indicators (progress measures and outputs) presented in table B.3 include items from a proposed NHA indicator set released in 2008 (AIHW 2008a). Further work to develop these indicators has been undertaken, but is yet to be publicly released. NHA indicators for other areas that relate to hospital performance are listed in table B.4.

Table B.3 **Hospital and related care performance indicators**

Progress measure	*Output*
Waiting times for: • elective surgery • emergency department services. Selected adverse events in acute and sub-acute care settings, including: • adverse drug events • *Staphylococcus aureus* (including MRSA) bacteraemia • pressure ulcers • falls resulting in patient harm • intentional self-harm. Unplanned or unexpected readmissions within 28 days of selected surgical admissions. Survival of people diagnosed with cancer (5 year relative rate).	Rates of services provided by public and private hospitals per 1000 weighted population by patient type.

Source: COAG (2008d); AIHW (2008a).

Table B.4 **Other NHA indicators related to hospital performance**

Area	*Progress measure*	*Output*
Primary and community health	Selected potentially preventable hospitalisations.	
Aged care		Number hospital patient days by those eligible and waiting for residential aged care.
Patient experience	Nationally comparable information that indicates levels of patient satisfaction around key aspects of care they received.	
Social inclusion and Indigenous health	Access to services by type of service compared to need.	
Sustainability	Cost per casemix-adjusted separation for both acute and non-acute care episodes.	

Source: COAG (2008d).

C Other health performance monitoring frameworks

The National Healthcare Agreement (NHA) and associated performance indictors are described in appendix B. Two other national health performance monitoring frameworks developed prior to the NHA performance indicators are the National Health Performance Framework (NHPF) and the Report on Government Services health performance monitoring framework. These frameworks focus on the health system as a whole, or large components of it, and both include performance monitoring of public hospitals.

C.1 National Health Performance Framework

The NHPF was developed to report the performance of the Australian health system at a national level. The NHPF was developed by the National Health Performance Committee (NHPC) at the request of the Australian Health Ministers' Conference and was published in 2001 (NHPC 2001).[1] In August 2001, Australian Health Ministers agreed to this overarching performance framework for use in reporting across all areas of the health system.

The NHPF has a broader focus than the national reporting previously undertaken by the NHPC, which had focused on performance of acute hospital inpatient services. The NHPF focuses on overall health systems performance, which includes not only acute inpatient services, but also services such as community health, general practice and public health. The NHPF also differs from previous Australian frameworks as it focuses not only on system performance, but also on health status

[1] The NHPC's mission was to foster the use of benchmarking based on national performance measures and indicators to improve the quality of care of health services. The group was a standing committee of the National Health Information Management Principal Committee, which in turn advised the Australian Health Ministers' Advisory Council on matters including information requirements and technology planning. The NHPC comprised representatives from the Australian, State and Territory Governments and a number of other organisations, including the Australian Health Insurance Association, the Australian Private Hospitals Association and the Australian Institute of Health and Welfare. Some NHPC functions have now been assumed by the National Health Information Standards and Statistics Committee.

and health determinants. It also includes areas such as capability and sustainability that had not been widely reported in the past.

The NHPF was seen as a structure to guide the understanding and evaluation of health service performance in Australia. The framework consists of three tiers (table C.1):

- health status and outcomes
- determinants of health
- health system performance.

Table C.1 **The National Health Performance Framework**

Health status and outcomes

How healthy are Australians? Is it the same for everyone? Where is the most opportunity for improvement?

Health Conditions	*Human Function*	*Life Expectancy and Wellbeing*	*Deaths*
Prevalence of disease, disorder, injury or trauma or other health-related states.	Alterations to body, structure or function (impairment), activities (activity limitation) and participation (restrictions in participation).	Broad measures of physical, mental and social wellbeing of individuals and other derived indicators such as disability-adjusted life expectancy.	Age and/or condition specific mortality rates.

Determinants of health

Are the factors determining health changing for the better? Is it the same for everyone? Where and for whom are they changing?

Environmental Factors	*Socioeconomic Factors*	*Community Capacity*	*Health Behaviours*	*Person-related Factors*
Physical, chemical and biological factors such as air, water, food and soil quality resulting from chemical pollution and waste disposal.	Socioeconomic factors such as education, employment, per capita expenditure on health, and average weekly earnings.	Characteristics of communities and families such as population density, age distribution, health literacy, housing, community support services and transport.	Attitudes, beliefs, knowledge and behaviours, e.g. patterns of eating, physical activity, excess alcohol consumption and smoking.	Genetic-related susceptibility to disease and other factors such as blood pressure, cholesterol levels and body weight.

(Continued next page)

Table C.1 **(continued)**

Health system performance		
How well is the health system performing in delivering quality health actions to improve the health of all Australians? Is it the same for everyone?		
Effective	*Appropriate*	*Efficient*
Care, intervention or action achieves desired outcome.	Care/intervention/action provided is relevant to the client's needs and based on established standards.	Achieving desired results with most cost effective use of resources.
Responsive	*Accessible*	*Safe*
Service provides respect for persons and is client orientated. It includes respect for dignity, confidentiality, participation in choices, promptness, quality of amenities, access to social support networks, and choice of provider.	Ability of people to obtain health care at the right place and right time irrespective of income, physical location and cultural background.	The avoidance or reduction to acceptable limits of actual or potential harm from health care management or the environment in which health care is delivered.
Continuous	*Capable*	*Sustainable*
Ability to provide uninterrupted, coordinated care or service across programs, practitioners, organisations and levels over time.	An individual's or service's capacity to provide a health service based on skills and knowledge.	System's or organisation's capacity to provide infrastructure such as workforce, facilities and equipment, and be innovative and respond to emerging needs (research, monitoring).

Source: NHPC (2001).

Questions are posed for each tier and dimension and it was anticipated by the NHPC that performance indicators would be chosen or developed to provide answers about the performance of the system (NHPC 2001). Equity is considered to be integral to each of the three tiers and is represented in each by the question 'is it the same for everyone?' Quality is also an integral part of the framework, and the dimensions considered in determining the quality of the health system are very similar to those measuring health system performance.

Indicators within the NHPF

The NHPC was also tasked with identifying and developing indicators to be reported against the NHPF. The selection criteria used by the NHPC to select the indicators are shown in box C.1. An indicator could provide information in several dimensions across the framework.

Box C.1 Selection criteria used by the NHPC for health performance indicators

Generic indicators when used at a program level to whole-of-system level should have all or some of the following qualities. They should:

1. Be worth measuring.

   The indicators represent an important and salient aspect of the public's health or the performance of the health system.

2. Be measurable for diverse populations.

   The indicators are valid and reliable for the general population and diverse populations (that is, Aboriginal and Torres Strait Islander populations, sex, rural/urban, socioeconomic etc.)

3. Be understood by people who need to act.

   People who need to act on their own behalf or that of others should be able to readily comprehend the indicators and what can be done to improve health.

4. Galvanise action.

   The indicators are of such a nature that action can be taken at the national, state, local or community level by individuals, organised groups and public and private agencies.

5. Be relevant to policy and practice.

   Actions that can lead to improvement are anticipated and feasible — they are plausible actions that can alter the course of an indicator when widely applied.

6. Reflect results of actions when measured over time.

   If action is taken, tangible results will be seen indicating improvements in various aspects of the nation's health.

7. Be feasible to collect and report.

   The information required for the indicator can be obtained at reasonable cost in relation to its value and can be collected, analysed and reported on in an appropriate time frame.

8. Comply with national processes of data definitions.

Source: NHPC (2002).

The NHPC reported indicator data against the NHPF in its *National Report on Health Sector Performance Indicators* for 2001 and 2003 (NHPC 2002 and 2004). The 2003 Report contained 44 indicators, with eight reported against health status and outcomes, 11 against determinants of health and 25 reported against health system performance (table C.2). The NHPF has since been reported as part of the *Australia's Health* report published by the Australian Institute of Health and Welfare, most recently in 2008 (AIHW 2008c).

Table C.2 **Indicators reported in the National Report on Health Sector Performance, 2003**

Health status and outcomes

Health Conditions	*Human Function*	*Life Expectancy and Wellbeing*	*Deaths*
Incidence of cancer. Incidence of heart attacks.	Severe or profound core activity limitation.	Life expectancy. Psychological distress.	Potentially avoidable deaths. Infant mortality. Mortality for national Health Priority Area diseases and conditions.

Determinants of health

Environmental Factors	*Socioeconomic Factors*	*Community Capacity*	*Health Behaviours*	*Person-related Factors*
Children exposed to tobacco smoke in the home. Availability of fluoridated water.	Income inequality.	Informal care.	Adult smoking. Risky alcohol consumption. Fruit and vegetable intake. Physical inactivity. Overweight and obesity.	Low birthweight babies. High blood pressure.

Health system performance

Effective	*Appropriate*	*Efficient*
Unsafe sharing of needles. Teenage purchase of cigarettes. Cervical screening. Breast cancer screening. Childhood immunisation. Influenza vaccination. Potentially preventable hospitalisations. Survival following acute coronary heart disease event. Cancer survival.	Appropriate use of antibiotics. Management of diabetes. Delivery by caesarean section. Hysterectomy rate.	Hospitals costs. Length of stay in hospital.

(Continued next page)

Table C.2 (continued)

Responsive	*Accessible*	*Safe*
Waiting times in emergency departments.	Bulk billing for non-referred (GP) attendances. Availability of GP services. Access to elective surgery.	Electronic prescribing and clinical data in general practice. Adverse events treated in hospitals.
Continuous	*Capable*	*Sustainable*
Enhance primary care services. Health assessments by GPs.	Accreditation in general practice.	Health workforce.

Source: NHPC (2004).

Although the primary purpose of the NHPF was performance measurement at the national level, the framework was intended to support performance measurement at all levels of the health system. A number of groups involved in health performance indicator development have adopted this framework for use within specific project areas and in publications. For example, the health performance indicator frameworks contained within the Report on Government Services have been aligned as much as possible with the NHPF (SCRGSP 2009). In addition, the Aboriginal and Torres Strait Islander Health Performance Framework is based on the NHPF (AHMAC 2006). A set of key performance indicators for Australian public mental health services was also developed using the NHPF (NMHWG 2005).

C.2 Review of Government Service Provision

The Review of Government Service Provision (the Review) has developed performance monitoring frameworks that have been applied across a number of areas of government service provision, including health services. Health services examined in the Review include public hospitals, primary and community health, breast cancer detection and management and specialist mental health management. Data are reported against these frameworks on an annual basis in the Report on Government Services (the Report) (box C.2).

Health services are included in the Report as they are an important component of government service provision. Over 40 per cent of expenditure within the scope of reporting of the Report on Government Services 2009 was accounted for by health services (SCRGSP 2009).

Box C.2 Aims of the Review of Government Service Provision

Heads of government (now the Council of Australian Governments or COAG) established the Review of Government Service Provision (the Review) to provide information on the effectiveness and efficiency of government services in Australia. A Steering Committee, comprising senior representatives from the central agencies of all governments, manages the Review with the assistance of a Secretariat provided by the Productivity Commission.

The Review was established in 1993 to:

- provide ongoing comparisons of the performance of government services
- report on service provision reforms that governments have implemented or that are under consideration.

The Review has produced 14 editions of the annual Report on Government Services since it was established, with the most recent being published in January 2009.

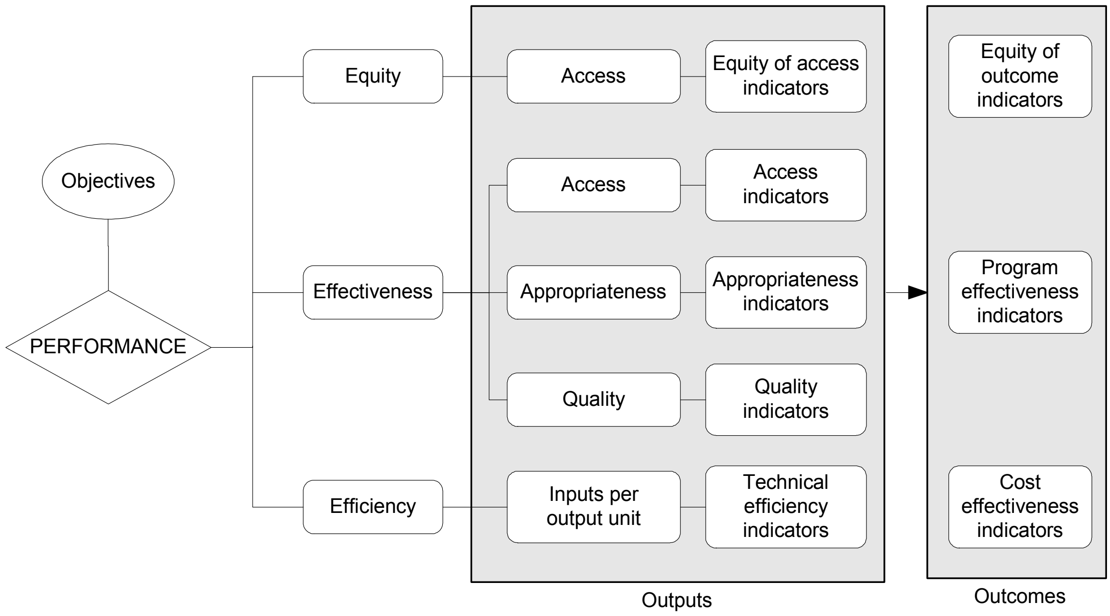
Source: SCRGSP (2009).

General framework

The Report's general performance framework is set out in figure C.1. The framework depicts the Review's focus on outcomes, consistent with demand by governments for outcome-oriented performance information. This outcome information is supplemented by information on outputs. Output indicators are grouped under 'equity', 'effectiveness' and 'efficiency' headings (SCRGSP 2009).

Outcome indicators provide information on the impact of a service on the status of an individual or a group, and on the success of the service area in achieving its objectives. Outputs are the actual services delivered. While the aim of the Review is to focus on outcomes, they are often difficult to measure. The Report therefore includes measures of outputs, with an understanding that there is a correlation between those outputs and desired outcomes, and that the measures of outputs are proxies for measures of outcomes.

Figure C.1 **Report on Government Services general framework**



Source: SCRGSP (2009).

A comprehensive view of performance reporting is taken by the Review, and its frameworks incorporate indicators across all relevant dimensions of performance, namely effectiveness, efficiency and equity. There are inherent tradeoffs in allocating resources and dangers in analysing only some aspects of a service. For example, a unit of service may have a high cost but be more effective than a lower-cost service, and therefore be more cost effective. It is also important that services are provided equitably.

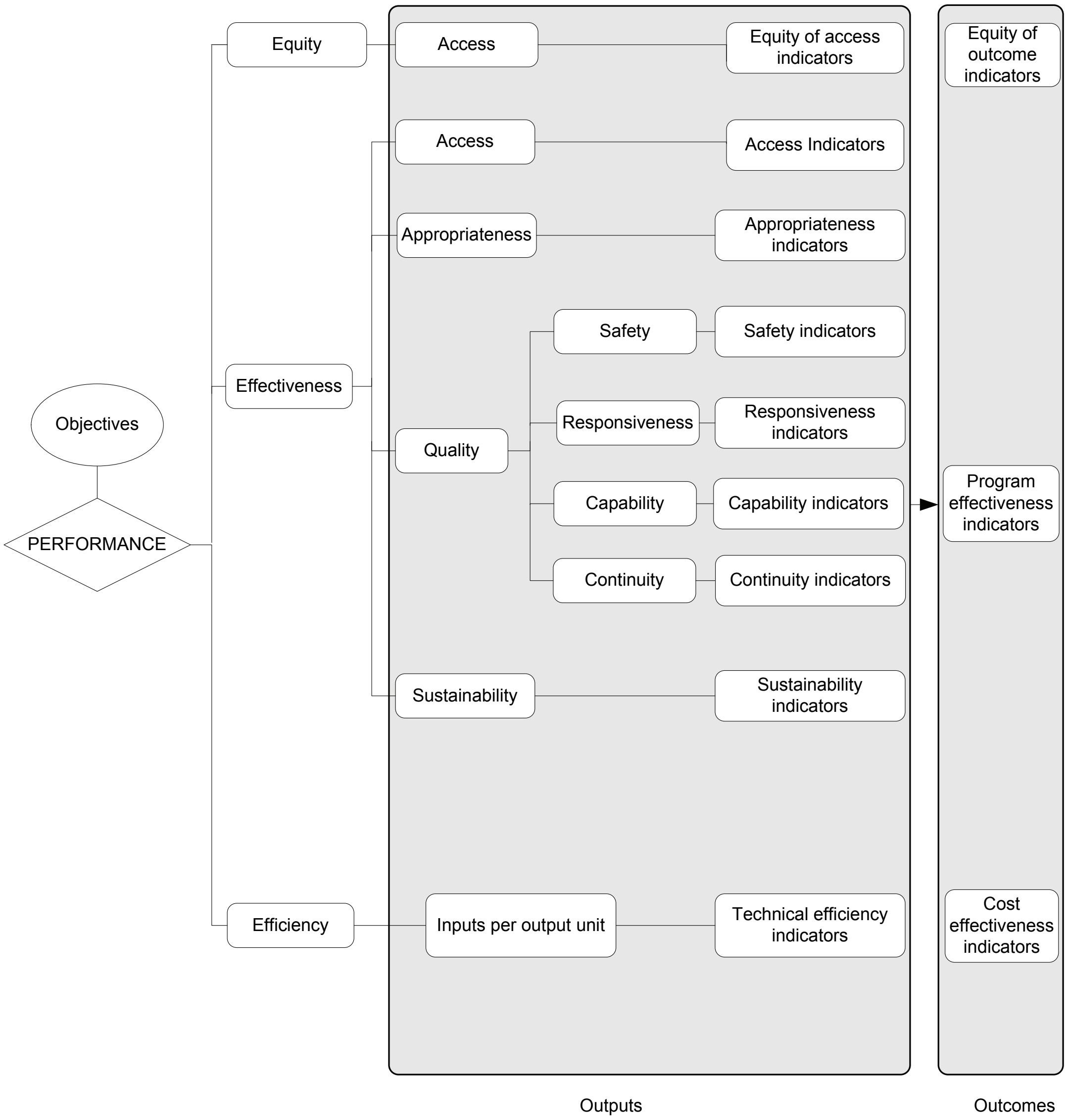
Equity of access indicators relate to the gap in service delivery outputs and outcomes between special-needs groups and the general population. Effectiveness indicators measure how well the outputs of a service achieve the stated objectives of that service. Effectiveness comprises appropriateness indicators, which measure how well services meet client needs, and quality indicators, which reflect the extent to which a service is suited to its purpose and conforms to specifications. Effectiveness also includes access indicators whereby all Australians are expected to have adequate access to services. This notion of access differs from that of equity of access, which is concerned with access by special-needs groups. Efficiency indicators measure how well services use their resources (inputs) to produce outputs for the purpose of achieving desired outcomes.

Health performance framework

The performance framework for health services in the Report on Government Services reflects both the general Review framework and the NHPF. In the *Report on Government Services 2004*, the Review of Government Service Provision sought to align the health framework with the NHPF as far as possible. Complete alignment was not possible, given the different terms of reference of the two committees. The health framework differs from the general Review framework in two respects. First, it includes four subdimensions of quality — safety, responsiveness, capability and continuity — and, second, it includes an extra dimension of effectiveness — sustainability (figure C.2). These additions are intended to address the following key performance dimensions of the health system in the NHPF that were not explicitly covered in the general Review framework:

- safety — the avoidance, or reduction to acceptable levels, of actual or potential harm from health care services, management or environments, and the prevention or minimisation of adverse events associated with health care delivery
- responsiveness — the provision of services that are client-oriented and respectful of clients' dignity, autonomy, confidentiality, amenity, choices, and social and cultural needs
- capability — the capacity of an organisation, program or individual to provide health care services based on appropriate skills and knowledge
- continuity — the provision of uninterrupted, timely, coordinated healthcare, interventions and actions across programs, practitioners and organisations
- sustainability — the capacity to provide infrastructure (such as workforce, facilities and equipment), be innovative and respond to emerging needs (NHPC 2001).

Figure C.2 **Performance indicator framework for health services**



Source: SCRGSP (2009).

Specific performance indicator frameworks

The Review of Government Service Provision has used the health performance framework to develop:

- detailed performance indicator frameworks for public hospitals and primary and community health services

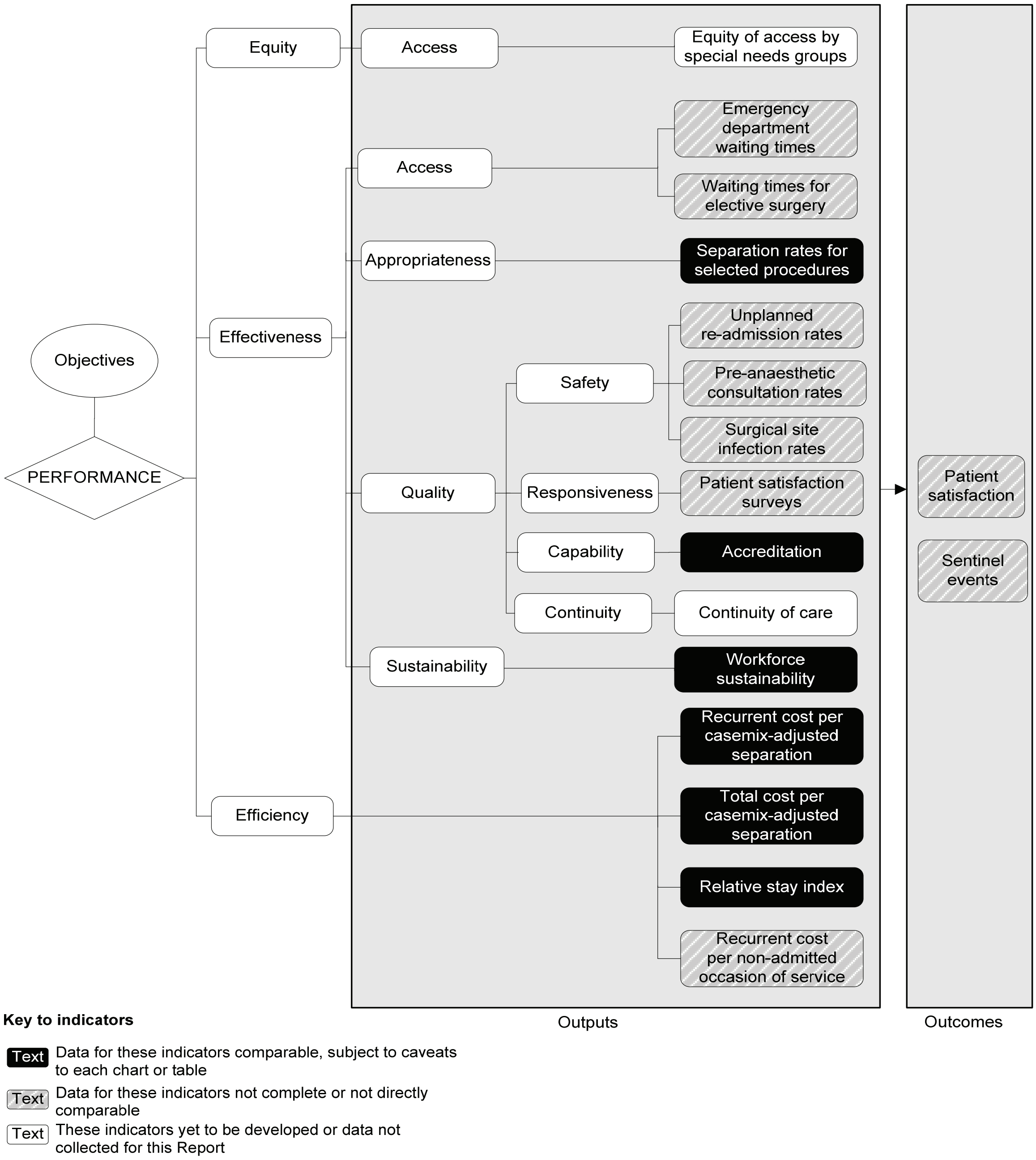
- specific frameworks to examine the appropriate mix of services and service-delivery mechanisms for two health management issues: breast cancer and mental health.

Figures C.3 and C.4 depict the public hospitals performance indicator framework and the maternity services indicator framework. Maternity services are included as part of public hospital reporting in the Report on Government Services, as they are an important component of services provided within public hospitals. Maternity services accounted for 9.2 per cent of total acute separations in public hospitals and around 11.0 per cent of the total cost of all acute separations in public hospitals in 2006-07 (SCRGSP 2009).

The frameworks depict the dimensions of both the Review of Government Service Provision and the NHPF. The frameworks are populated with the performance indicators. The choice of indicators has been strongly influenced by the priorities of Australian, state and territory governments. For example, reducing elective surgery waiting times has long been a priority of governments around Australia and waiting times for elective surgery are included in the framework. As there has been a degree of alignment between the Review framework and the NHPF, and both frameworks reflect governments' priorities, a number of indicators are common to both the Review framework and the NHPF. In addition, the approach taken by the Review is to use indicators that are already in use in Australia or internationally. Adopting these indicators can lower the costs of, and reduce delays in, reporting performance.

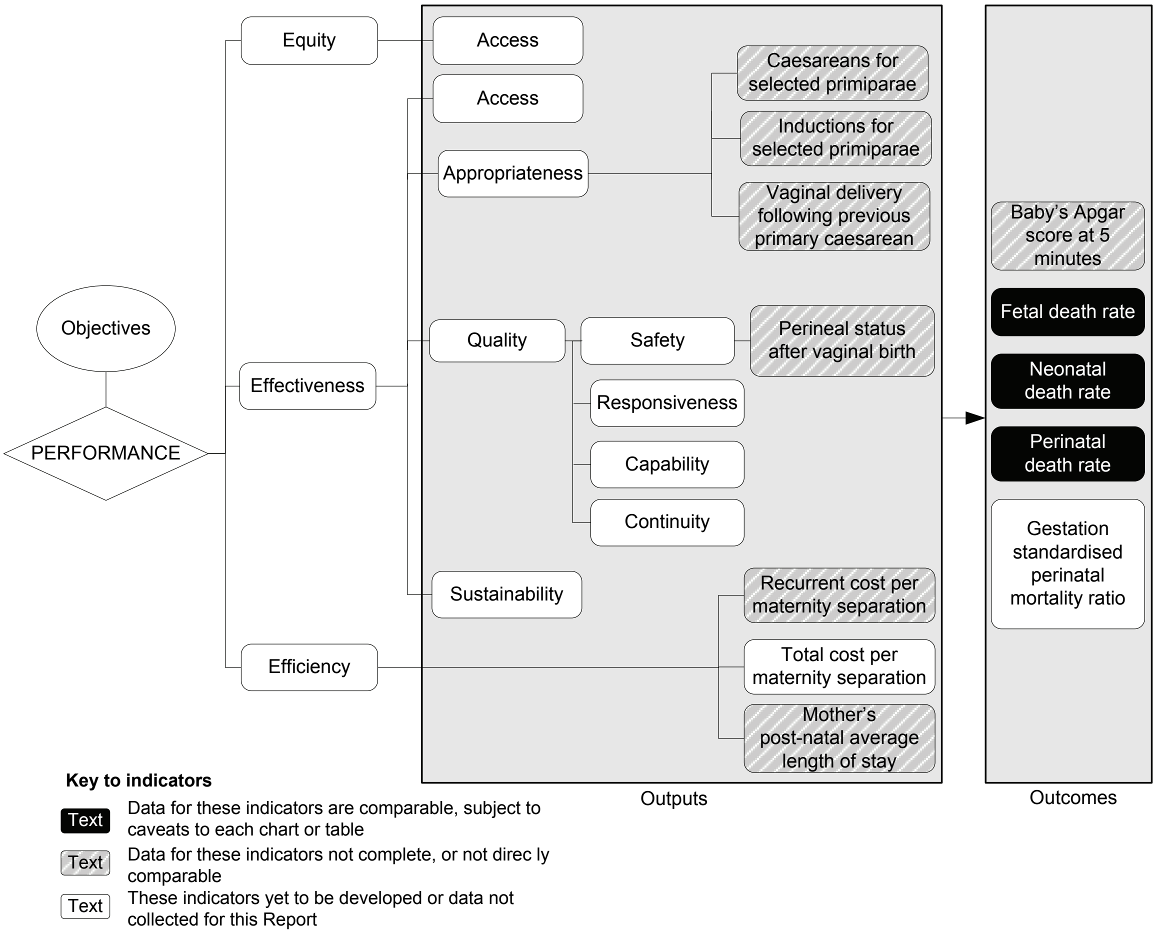
The framework identifies those indicators that are not complete or directly comparable. This signifies the Review's approach of using acceptable, albeit less than perfect indicators with appropriate caveats, rather than reporting no data at all for an indicator. Data are generally presented for those jurisdictions that can currently report, rather than waiting until data are available for all jurisdictions. The framework also identifies those indicators that are yet to be developed or where data are not available. This shows that even though reporting for these indicators is not currently possible, these areas are still a priority of governments.

Figure C.3 **Performance indicators for public hospitals**



Source: SCRGSP (2009).

Figure C.4 **Performance indicators for maternity services**



Source: SCRGSP (2009).

D Constructing estimates of hospital and medical costs

Constructing cost estimates for this study has been a major challenge because:

- existing data collections are limited by inconsistent collection methods and missing information
- differences between hospitals in the types of patients treated and services provided make like-for-like comparisons difficult.

This appendix details how the Commission has sought to address the data limitations, and take account of the diversity and complexity of hospitals, by drawing on various data sources and, where necessary, incorporating adjustments to make the data more comparable. However, the Commission readily acknowledges that significant data shortcomings have limited its ability to construct fully-comparable costs. The Commission therefore stresses that the cost estimates in this report should be treated as experimental.

D.1 National Hospital Cost Data Collection

The National Hospital Cost Data Collection (NHCDC) is a voluntary collection of public and private hospital cost and activity information that is collected each financial year. The purpose of the NHCDC is to 'produce national cost weights for Australian Refined Diagnosis-Related Groups (AR-DRGs) and other statistics relevant for hospital service costing and planning' (Australian Government Department of Health and Ageing (DOHA) 2008c, p.7). The first round of the NHCDC was collected in 1996-97, and the most recent round (Round 12) was collected in 2007-08.[1]

The collection and reporting process for the NHCDC has several steps, as outlined in box D.1. These steps ultimately result in the production of two reports — the *Cost Report* and the *Peer Group Report.*

[1] Rounds 8, 9 and 10 (2003-04 to 2005-06) of the NHCDC only include data for public hospitals (DOHA 2009a).

Box D.1 **NHCDC collection and reporting process**

The collection and reporting process of the National Hospital Cost Data Collection (NHCDC) is as follows:

Stage 1: Preparation

The preparation for data collection is the process that is followed at the start of each new round. Collection is initially undertaken by public hospitals within each state and territory, and by private hospitals and private hospital groups.

Guidelines for the collection of data are stipulated within the *Hospital Reference Manual* which is released around August or September of the year prior to the collection period.

Participant training is generally conducted by the Australian Government Department of Health and Ageing (DOHA), and/or the relevant state or territory coordinator, between January and March of the collection year.

Stage 2: Collection

The data collection component of the costing process is undertaken in collaboration with the state and territory coordinators of public hospitals, private hospitals and private hospital groups. They undertake initial quality assurance checks before data are submitted to DOHA for further verification.

Stage 3: National receipt and processing

After the receipt of data, DOHA checks, processes and constructs the final files required to produce a national database. DOHA then produces estimates for the total hospital population based on the sample collection.

Stage 4: Analysis and reporting

Analysis and reporting of the data is finalised by the NHCDC team within DOHA. A number of reports, including the *Cost Report* and the *Peer Group Report* (for public hospitals), are then produced.

Source: DOHA (2008c).

In this report, the Commission has used unpublished NHCDC data from Round 12 (2007-08) to generate its cost estimates. The 2007-08 NHCDC was contributed to by 241 public hospitals and 109 private hospitals (tables D.1, D.2 and D.3). This covered 89 per cent of public acute separations and 72 per cent of private acute separations (DOHA 2009a).[2]

2 Separations data supplied by state and territory coordinators for the NHCDC is the source of a population estimate of 4 508 000 public-hospital separations. The AIHW (2009a) estimated that the total number of public hospital acute separations in 2007-08 was 4 462 000, implying a coverage of just over 90 per cent. Private hospital acute separations data used to calculate

Table D.1 **NHCDC sample by jurisdiction and region, 2007-08**[a, b]

	NSW	*Vic*	*Qld*	*SA*	*WA*	*Tas, NT & ACT* [b]	*Australia*
Public hospitals							
Major City							
No. of hospitals	41	27	14	8	11	2	103
No. of separations	960 597	882 312	412 617	244 162	298 823	76 462	2 874 973
Inner Regional							
No. of hospitals	30	17	10	10	2	4	73
No. of separations	284 773	192 251	164 273	21 797	15 671	79 147	757 912
Outer Regional							
No. of hospitals	11	5	6	17	5	8	52
No. of separations	45 734	25 022	122 029	42 299	36 840	61 665	333 589
Remote							
No. of hospitals	–	–	1	3	2	3	9
No. of separations	–	–	1 118	6 163	10 426	38 594	56 301
Very Remote							
No. of hospitals	–	–	–	1	–	3	4
No. of separations	–	–	–	1 640	–	8 172	9 812
Total							
No. of hospitals	82	49	31	39	20	20	241
No. of separations	1 291 104	1 099 585	700 037	316 061	361 760	264 040	4 032 587
Private hospitals							
Major City							
No. of hospitals	22	24	12	8	7	3	76
No. of separations	337 391	388 412	268 514	119 880	178 887	35 280	1 328 364
Inner Regional							
No. of hospitals	9	5	13	–	1	2	30
No. of separations	51 169	34 265	104 423	–	18 269	32 669	240 795
Outer Regional							
No. of hospitals	–	–	2	–	–	1	3
No. of separations	–	–	32 927	–	–	5 592	38 519
Remote							
No. of hospitals	–	–	–	–	–	–	–
No. of separations	–	–	–	–	–	–	–
Very Remote							
No. of hospitals	–	–	–	–	–	–	–
No. of separations	–	–	–	–	–	–	–
Total							
No. of hospitals	31	29	27	8	8	6	109
No. of separations	388 560	422 677	405 864	119 880	197 156	73 541	1 607 678

[a] Regions are based on ABS *Australian Standard Geographical Classification*, Cat. no. 1216.0 [b] Separations are not casemix adjusted. [c] Data for Tasmania, the Northern Territory and the ACT are aggregated to protect the confidentiality of the small number of hospitals in each of these jurisdictions. – Nil.

Source: DOHA (unpublished data).

NHCDC coverage is extracted from the Private Hospital Data Bureau collection (DOHA 2009a).

Table D.2 NHCDC sample by jurisdiction and hospital size, 2007-08[a]

	NSW	*Vic*	*Qld*	*SA*	*WA*	*Tas, NT & ACT* [b]	*Australia*
Public hospitals							
Very large							
No. of hospitals	21	18	12	5	5	4	65
No. of separations	804 241	781 645	493 750	216 403	236 970	180 549	2 713 558
Large							
No. of hospitals	18	11	10	1	3	3	46
No. of separations	261 183	212 144	178 845	10 904	49 246	65 119	777 441
Medium							
No. of hospitals	15	6	2	4	6	–	33
No. of separations	130 778	56 962	13 108	35 352	59 553	–	295 753
Small							
No. of hospitals	22	5	2	10	3	1	43
No. of separations	82 647	37 253	7 740	34 965	12 886	6 035	181 526
Very small							
No. of hospitals	6	9	5	19	3	12	54
No. of separations	12 255	11 581	6 594	18 437	3 105	12 337	64 309
Total							
No. of hospitals	82	49	31	39	20	20	241
No. of separations	1 291 104	1 099 585	700 037	316 061	361 760	264 040	4 032 587
Private hospitals							
Very large							
No. of hospitals	8	6	8	3	4	–	29
No. of separations	213 022	184 939	233 570	73 199	159 193	–	863 923
Large							
No. of hospitals	5	7	5	2	1	3	23
No. of separations	62 148	110 889	78 008	25 723	18 269	47 774	342 811
Medium							
No. of hospitals	9	11	6	1	1	2	30
No. of separations	71 495	99 731	57 841	11 804	12 090	20 175	273 136
Small							
No. of hospitals	8	4	7	2	2	1	24
No. of separations	39 750	24 044	35 853	9 154	7 604	5 592	121 997
Very small							
No. of hospitals	1	1	1	–	–	–	3
No. of separations	2 145	3 074	592	–	–	–	5 811
Total							
No. of hospitals	31	29	27	8	8	6	109
No. of separations	388 560	422 677	405 864	119 880	197 156	73 541	1 607 678

[a] Hospital size defined by annual casemix-adjusted separations as follows: very large (more than 20 001), large (10 001 to 20 001), medium (5001 to 10 000), small (2001 to 5000), and very small (up to 2000). Casemix adjustment for the purpose of allocating hospitals to a size group was undertaken by DOHA using separate cost weights for public and private hospitals. The number of separations in the table above are not casemix adjusted and so may not correspond to hospital category size, which is based on casemix-adjusted separations. [b] Data for Tasmania, the Northern Territory and the ACT are aggregated to protect the confidentiality of the small number of hospitals in each of these jurisdictions. – Nil.

Source: DOHA (unpublished data).

Table D.3 **NHCDC sample by region and hospital size, 2007-08[a]**

	Major city	Inner regional	Outer regional	Remote	Very Remote	Australia
Public hospitals						
Very large						
No. of hospitals	52	10	3	–	–	65
No. of separations	2 285 222	294 971	133 365	–	–	2 713 558
Large						
No. of hospitals	27	16	2	1	–	46
No. of separations	435 041	269 478	40 880	32 042	–	777 441
Medium						
No. of hospitals	10	13	10	–	–	33
No. of separations	96 749	106 318	92 686	–	–	295 753
Small						
No. of hospitals	8	19	12	4	–	43
No. of separations	48 991	70 554	41 141	20 840	–	181 526
Very small						
No. of hospitals	6	15	25	4	4	54
No. of separations	8 970	16 591	25 517	3 419	9 812	64 309
Total						
No. of hospitals	103	73	52	9	4	241
No. of separations	2 874 973	757 912	333 589	56 301	9 812	4 032 587
Private hospitals						
Very large						
No. of hospitals	29	–	–	–	–	29
No. of separations	863 923	–	–	–	–	863 923
Large						
No. of hospitals	14	8	1	–	–	23
No. of separations	207 621	113 309	21 881	–	–	342 811
Medium						
No. of hospitals	20	9	1	–	–	30
No. of separations	188 105	73 985	11 046	–	–	273 136
Small						
No. of hospitals	13	10	1	–	–	24
No. of separations	68 715	47 690	5 592	–	–	121 997
Very small						
No. of hospitals	–	3	–	–	–	3
No. of separations	–	5 811	–	–	–	5 811
Total						
No. of hospitals	76	30	3	–	–	109
No. of separations	1 328 364	240 795	38 519	–	–	1 607 678

[a] Regions are classified according to the Australian Standard Geographical Classification (detailed in ABS 2005). Hospital size defined by annual casemix-adjusted separations as follows: very large (more than 20 001), large (10 001 to 20 001), medium (5001 to 10 000), small (2001 to 5000), and very small (up to 2000). Casemix adjustment for the purpose of allocating hospitals to a size group was undertaken by DOHA. [b] The number of separations in the table are not casemix-adjusted and may not correspond to hospital category size, which is based on casemix-adjusted separations. – Nil.

Source: DOHA (unpublished data).

The NHCDC data provided to the Commission differ from those used in the Round 12 Cost Report (DOHA 2009a). In particular, the unpublished NHCDC data provided to the Commission by DOHA are unweighted, and so may not necessarily be representative of the broader hospital sector. In addition, some separations were excluded from the cost analysis due to small sample sizes. DRGs were excluded if there were fewer than 30 separations at a national level, or fewer than five separations in a particular jurisdiction, or if separations occurred in fewer than three hospitals.

The Commission also excluded a number of DRGs from the cost analysis, on the advice of study participants. DRGs relating to mental diseases and disorders or drug and alcohol use (those beginning with either a ‘U’ or a ‘V’) were not included because of ‘the combination of lack of robust classification systems and very different models of paying for care in different jurisdictions’ (Australian Health Service Alliance, sub. 1, p. 3). The Commission also took account of advice from the Australian Health Service Alliance (sub. 1) that the rehabilitation DRGs be excluded, due to the potential for heterogeneity. Similarly, the ‘error DRGs’ (those with the AR-DRG prefix ‘9’) were not included due to their (unknown) heterogeneity.

Data not included in the NHCDC

While the NHCDC is the most useful source of hospital cost information, there are a number of cost areas for which it does not provide information.

Most notably, the NHCDC does not include costs for a large proportion of medical and diagnostics expenditure in private hospitals because these items are often billed directly to patients. Information regarding medical costs for private patients in public hospitals is also not included for this reason. The Commission has to some extent been able to adjust the data for this lack of information by including medical and imaging costs from the Hospital Casemix Protocol (HCP) dataset. This is discussed further in section D.2.

Information about capital costs is also deficient in the NHCDC. There are no data on the user cost of capital, and costing practices unique to Victoria mean that there are no depreciation costs for public hospitals in that jurisdiction. This is discussed further in section D.6.

Costs associated with blood products are also not included in the NHCDC. Similarly, teaching costs are not specifically identified, implying that either these costs are not included, or they are incorporated into other categories.

Inconsistencies within the NHCDC

There are a number of differences both within and between the private and public sectors that are likely to impact on the cost estimates (Tasmanian Department of Health and Human Services, sub. 37). Differences in reported costs result from factors such as different reporting practices and obligations, and admission practices.

Publicly available documentation on different reporting practices is limited. For example, there is considerable ambiguity regarding how administrative overhead costs are treated, and the extent to which they are included in the NHCDC. It is similarly unclear how teaching, training and research costs are treated.[3]

Another key difference in the reporting of costs between public and private sector hospitals in the NHCDC is the predominance of 'cost modelling' to produce cost estimates in the private sector, in comparison to 'patient costing' for the majority of public hospitals.

Cost modelling involves allocating aggregate costs to individual separations through the use of national utilisation averages, or service weights. Service weights are derived from individual studies designed specifically for the resource area to which they relate, and reflect the cost of intermediate resources used in each respective DRG. More than 90 per cent of private hospitals providing data to the NHCDC report cost-modelled data (DOHA 2008c).

One potential issue with cost modelling is that it can lead to a 'systemic under-costing of high-cost activity and over-costing of low-cost activity', due to the potential for averaging of costs within hospitals and within DRGs (Tasmanian Department of Health and Human Services, sub. 37, pp. 7–8).

In contrast, patient costing involves attributing costs directly to patients as they occur, often through the use of automated clinical information systems. DOHA (sub. 32) noted that approximately 75 per cent of public-sector cost data are patient-costed. It is worth noting that some patient-costed sites do use service weights to allocate costs for resources in various disciplines.

As well as differences in the way data are collected and reported, differing admission practices and access to hospitals lead to variation in the average costs reported across jurisdictions. For example, in public hospitals in New South Wales,

3 The Commission understands that 132 of the 241 hospitals that submitted data to Round 12 of the NHCDC separately identify teaching, training and research costs and exclude this from the analysis. Western Australian hospitals are among those that do not separately identify these costs (Department of Health, Government of Western Australia, sub. DR72).

South Australia and the ACT, there has been a shift over recent years from admitting chemotherapy patients to treating them as non-admitted patients (AIHW 2009a). Furthermore, states and territories may differ in the extent to which certain types of services are provided in non-hospital settings, such as community health centres.

NHCDC costs relating to public hospitals in different jurisdictions are to some extent based on different costing standards due to different reporting requirements. For example, Victorian public hospital costs are compliant with the Clinical Costing Standards Association of Australia and are subsequently mapped to the NHCDC cost structure (DOHA 2009a). This results in differences in the areas of nursing, medical, on-costs and ward supplies cost buckets, as outlined in table D.4. Similarly, the NSW Government has noted that its intensive-care unit and emergency-department funding models may increase costs in those areas, while decreasing costs attributed to diagnostics and imaging (DOHA 2009a).

Table D.4 **Differences between Victoria and other jurisdictions for NHCDC cost buckets**

NHCDC cost bucket	*Description of Victorian data*
Ward medical	Includes surgical and non-surgical medical costs.
Ward nursing	In addition to nursing salaries and wages, includes the direct costs of running a ward (such as consumables and transport) and overhead costs (such as power and light, catering and cleaning). Includes 'non-ward' costs for admitted patients including Hospital in the Home, transit lounge, maternity and post-domiciliary nursing care.
Pathology	Similar across jurisdictions, including departmental salaries and wages, consumables and overhead costs.
Imaging	Similar across jurisdictions, including departmental salaries and wages, consumables and overhead costs.
Allied health	Includes similar costs to other jurisdictions (predominantly departmental salaries and wages for allied health staff).
Pharmacy	Similar across jurisdictions, including departmental salaries and wages, drugs, consumables and overhead costs.
Critical care	Similar across jurisdictions, including departmental medical and nursing salaries and wages, consumables and overhead costs for intensive-care units, neonatal intensive-care units, special-care nurseries, coronary-care units and high-dependency units.
Operating room	Similar across jurisdictions, including departmental salaries and wages, consumables (including anaesthetic drugs) and overhead costs.
Emergency departments	Similar across jurisdictions, including departmental salaries and wages, consumables and overhead costs.
Ward supplies and other overheads	Medical supplies are rolled into the clinical area where the expense is incurred, such as ward nursing or a clinical unit. Supplies are not restricted to direct departments.
Specialist procedure suites	Some specialist suites costs, such as catheterisation laboratory or bone marrow procedure rooms may be reported in the ward medical bucket.
Prostheses	Reported as prosthesis if identifiable by the health service. May be allocated to operating room bucket if not distinguished from operating room costs.
On-costs	Included directly in the department costs such as a ward or imaging department.
Hotel services	Generally distributed to other buckets directly based on activity type, as indirect costs in Victorian cost data.
Depreciation	Capital costs are not included in Victorian cost data.

Source: Victorian Department of Health (unpublished).

D.2 Hospital Casemix Protocol

Hospital Casemix Protocol (HCP) data are collected as part of the regulation of private health insurance, and are used as the source of private medical, imaging and diagnostic costs for this study. The HCP has clinical, demographic, benefit and charge data for privately-insured admitted-patient episodes nationally from

1996-97. The HCP for 2007-08 covered 592 public hospitals and 299 private hospitals (table D.5).

It is important to note that the HCP differs from the NHCDC in that it contains amounts charged to patients and benefits paid by insurers, rather than hospital expenditure (costs).

The collection of HCP data is a two-step process involving the provision of patient information from hospitals to health insurers and then from health insurers to DOHA. In the first step, hospitals are required to provide information to health insurers within six weeks of the insured person being discharged from hospital. In the second step, health insurers are required to provide data to DOHA within twelve weeks of the insured person being discharged from hospital.

Table D.5 **Hospital Casemix Protocol descriptive statistics, 2007-08**

	Units	*Public hospitals*	*Private hospitals*
Separations	No.	299 122	1 874 341
Hospitals	No.	592	299
Medical item charges	$m	190	2 340

Source: DOHA (unpublished data).

Limitations of the HCP collection

The HCP is considered to be representative of all separations for which private health insurance is claimed. This is in contrast to the NHCDC data, which are from a voluntary sample of hospitals. HCP data relating only to those hospitals which had submitted NHCDC data was requested by the Commission, however, the data supplied to the Commission by DOHA were for the full HCP collection. This means that the cost estimates presented in this study involve combining average costs of DRGs from different populations.

Patients who did not make a private health insurance claim, including Department of Veterans' Affairs patients, are excluded from the HCP data. In 2007-08, these patients accounted for around 90 per cent of separations in public hospitals (most of whom are public patients) and 20 per cent of separations in private hospitals (AIHW 2009a). This means that any private costs associated with the provision of medical and diagnostic services for these patients are not included in the cost estimates.

A major deficiency of the HCP is that public hospitals often fail to allocate separations to individual DRGs for their private patients. In 2007-08, around 80 per cent of separations for private patients in public hospitals were classified as ‘ungroupable’ in the HCP. In contrast, the HCP data relating to private hospitals is of a much higher quality, with only around 1 per cent of separations classified as ungroupable in 2007-08.

Medical and diagnostics costs would be understated in the Commission’s experimental cost estimates, particularly for public hospitals, if the ungroupable HCP separations were not assigned to individual DRGs. The Commission apportioned the ungroupable HCP medical and diagnostic costs across DRGs using the methods outlined in box D.2.

Box D.2 **Allocation of ungroupable HCP medical and diagnostics costs across DRGs**

A large proportion of public hospital separations in the Hospital Casemix Protocol dataset are not assigned to specific DRGs but rather are classified as ‘ungroupable’. This means that, without adjustments, the medical and diagnostics costs associated with these separations would not be included in cost estimates. ‘Ungroupable’ medical and diagnostics costs have been incorporated into cost estimates by allocating them across all DRGs in each sector, and for each jurisdiction.

Total ungroupable costs were first scaled to reflect that the NHCDC is only a sample of public hospital separations. Ungroupable costs were then allocated across DRGs on the basis of weighted separations. That is, each DRG was allocated the proportion of ungroupable costs corresponding to the relevant number of weighted separations. The number of private separations in public hospitals for each DRG was obtained from the National Hospital Morbidity Database. Because of the low quality of the public-hospital HCP data, average private medical charges from private hospital patients were then used to weight these separations.

The effect of incorporating these costs varied according to the number of ungroupable separations in the public-hospital HCP data, relative to the total number of separations in the NHCDC data, and the total amount of charges associated with ungroupable DRGs. At a national level, inclusion of the ungroupable HCP costs increased the Commission’s estimate of medical and diagnostics costs in public hospitals by $34 per casemix-adjusted separation (table D.6). Costs increased by $12 per casemix-adjusted separation in private hospitals.

Table D.6 **Ungroupable separations for private patients by sector, 2007-08[a]**

	Units	NSW	Vic	Qld	SA	WA	Tas, NT & ACT[b]	Aust.
Public hospitals								
Ungroupable HCP separations	'000	141	49	13	9	8	8	232
Total HCP separations	'000	144	86	14	25	9	11	299
Per cent ungroupable	%	97.9	56.3	92.3	37.2	96.6	74.9	77.6
Ungroupable HCP medical charges	$m	102	27	6	5	5	3	150
Total HCP medical charges	$m	104	51	6	11	5	6	190
Per cent ungroupable	%	98.5	53.6	93.4	42.0	97.4	61.4	78.8
Private hospitals								
Ungroupable HCP separations	'000	6	9	7	3	6	1	32
Total HCP separations	'000	474	473	397	157	197	74	1 874
Per cent ungroupable	%	1.3	1.9	1.8	1.7	2.8	1.4	1.7
Ungroupable HCP medical charges	$m	6	6	8	3	5	1	28
Total HCP medical charges	$m	651	582	539	194	243	91	2 340
Per cent ungroupable	%	1.0	1.0	1.4	1.3	1.9	1.1	1.2

[a] Ungroupable separations are those assigned the AR-DRG code 960Z. [b] Data for Tasmania, the Northern Territory and the ACT are aggregated to protect the confidentiality of the small number of hospitals in each of these jurisdictions.

Source: DOHA (unpublished data); Productivity Commission estimates.

D.3 Cost components

A measure of total cost was created by combining the different costs associated with an episode of care. As discussed in section D.1, cost components within the NHCDC vary in terms of consistency and comparability, both across and within sectors. Costs are accordingly presented in five broad groupings, as set out in table D.7, in order to aid comparability.

Table D.7 **Components of total cost estimates**[a]

Component	*Cost bucket*	*Description*
General hospital	Ward nursing	Nursing salaries and wages in general ward areas. Ward nursing costs may also be found in other buckets that have a medical salary and wages component, such as critical care, operating rooms, specialist procedures suites, emergency departments, imaging, pathology, allied health and pharmacy.
	Non-clinical salaries	This cost bucket includes all other costs of service provision for each inpatient separation during the collection period. These costs are primarily other salaries and wages such as patient-care assistants.
	Allied health	Costs of clinical services which are delivered by allied health professionals who have direct patient contact in areas such as audiology, physiotherapy, podiatry and dietetics.
	Critical care	Covers costs incurred in both intensive care and coronary care units.
	Operating room	Costs attributed to the area of a hospital where significant surgical procedures are carried out under surgical conditions, under the supervision of qualified medical practitioners.
	Specialist procedure suites	Costs incurred in areas where diagnostic and therapeutic procedures are performed under the direction of suitably qualified medical practitioners.
	Ward supplies & other overheads	Costs for goods and services, medical and surgical supplies, ward overheads and clinical department overheads.
	On-costs	Includes cost items such as superannuation, termination payments, workers compensation and long service leave.
	Hotel services	Includes food service, linen and grocery supplies.
Pharmacy	Pharmacy	The cost of providing a pharmacy. This includes the purchase, production, distribution, supply and storage of drugs and clinical pharmacy services. Pharmacy costs reported in critical care, operating rooms, specialist procedures suites, emergency departments, pathology, and imaging are not included in this bucket.
Emergency	Emergency departments	Area of the hospital where patients who present in an unscheduled manner can be triaged, assessed and treated. These costs relate to emergency patients who are subsequently admitted.
Prostheses	Prostheses	Prostheses appearing on hospital accounts and costs incurred by the hospital. Prostheses acquired by patients or their doctors directly (rather than by the hospital) will not show up on hospital accounts and are not reported.
Capital	Depreciation	The cost of depreciation for items that are durable, that can support production for an appreciable period of time and are purchased outright or donated. Depreciation costs are sourced from the NHCDC, with the exception of public hospitals in Victoria and Queensland which were derived from data published in SCRGSP (2009).
	User cost of capital	Estimates of the opportunity cost of funds tied up in the capital used to deliver services. Derived from data published by the ABS (2008e) and SCRGSP (2009) (see section D.6).

(Continued next page)

Table D.7 (continued)

Component	*Cost bucket*	*Description*
Medical & diagnostics	Ward medical	Salaries and wages of all medical officers (incl. sessional payments). Medical costs may also be found in other buckets that have a medical salary and wages component, such as critical care, operating rooms, specialist procedures suites, emergency departments, imaging, pathology, allied health and pharmacy.
	Imaging	Costs of diagnostic and therapeutic imaging. Excludes imaging costs reported in critical care, operating rooms, emergency departments, specialist procedures suites, pharmacy, and pathology.
	Pathology	Costs of diagnostic clinical laboratory testing for the diagnosis and treatment of patients. Excludes pathology costs reported in critical care, operating rooms, emergency departments, specialist procedures suites, pharmacy, and imaging.
	Medical charges	Total charge for medical and diagnostic items as presented in medical records associated with the episode of care. This component includes medical charges that are billed directly to the patient, and are sourced from HCP data.

[a] Cost buckets are cost categories incurred by the hospital and are drawn from the NHCDC, with the exception of the medical charges category, which is drawn from the HCP.

Source: DOHA (2008b, 2008c).

The first component — labelled 'general hospital' — comprises general cost items that are often under the control of a hospital.

Emergency departments and pharmacy costs are not included with 'general hospital' items because of significant differences between public and private sectors. Emergency departments are predominantly in the public sector, and typically involve significant fixed costs.

Pharmacy costs for private hospitals are likely to be significantly understated in the NHCDC as they are subsidised by the Australian Government under the Pharmaceutical Benefits Scheme (PBS) (Dr. John Deeble, sub. DR56; NSW Department of Health, sub. 41; DOHA, sub. 32).

The Australian Institute of Health and Welfare (AIHW 2009d) recently estimated the expected private hospital cost of pharmaceuticals. In 2005-06, pharmaceutical costs accounted for around 3.7 per cent of private hospital expenditure. If private hospitals had faced the same pharmaceutical costs as public hospitals, taking into account differences in casemix, pharmaceuticals would have accounted for 6.4 per cent of private hospital expenditure. This suggests that private hospitals have either substantially lower pharmaceutical costs, or up to 40 per cent of the pharmaceutical costs for patients in private hospitals are met by external arrangements, such as the PBS (AIHW 2009d).

Pharmacy costs for public hospitals are also likely to be understated. For jurisdictions other than Victoria, the NHCDC cost bucket for pharmacy does not include the cost of pharmaceuticals used in critical care, operating rooms, emergency departments, pathology, imaging, and specialist procedures suites. The extent to which pharmacy costs are included in other cost buckets varies between jurisdictions, due to differences in reporting practices. For those jurisdictions that submit sufficiently detailed data (New South Wales, Queensland, South Australia, Tasmania and the Northern Territory), it is estimated that around 76 per cent of all pharmaceutical costs are captured in the pharmacy cost bucket, with 12 per cent reported under operating rooms and 8 per cent under critical care (table D.8).

Prostheses are presented separately due to the different ways in which the costs are realised in both sectors (Australian Health Services Alliance, sub. 1; Catholic Health Australia, sub. 20). Prostheses in the public sector are typically purchased from relatively restricted lists at comparatively low costs, due to the presence of bulk purchasing arrangements.

In the private sector, most prostheses are purchased by the hospital and supplied to the patient by the hospital, although the choice of prosthesis is made by the treating doctors. Benefits for prostheses are payable to hospitals by private health insurers on the basis of amounts determined by the Minister for Health and Ageing, as presented in the Prostheses List (Catholic Health Australia, sub. DR62). Where there is a gap between the benefit paid by the fund and the prosthesis charge, this is typically paid by the patient to the hospital, and so is included in the NHCDC. Study participants indicated that private sector arrangements generally involve the use of a wider range of products, often at a noticeably greater cost (section D.8).

The experimental nature of the capital cost estimates necessitates that they be presented separately. The estimation of capital costs, as required by the terms of reference for the study, has been particularly challenging because of significant data constraints. Details about these estimates are presented in section D.6.

The medical and diagnostics component contains medical, imaging and pathology costs from the NHCDC, and medical charges from the HCP. As the HCP medical charge contains both medical and diagnostic costs, it is appropriate to group them all together in the interests of comparability.

The NHCDC cost bucket for ward medical excludes medical salaries and wages reported in imaging, pathology, critical care, operating rooms, emergency departments, specialist procedures suites, allied health, and pharmacy. This means that public-patient medical costs will be understated in the Commission's estimates to the extent that the NHCDC includes medical costs in the general hospital cost buckets (including critical care, operating rooms and specialist procedures suites), emergency departments and pharmacy costs.

Data for New South Wales, Queensland, South Australia, Tasmania and the Northern Territory suggest that around two-thirds of NHCDC medical costs are captured in the ward medical, pathology and imaging cost buckets, with the remaining medical costs being recorded in operating rooms, critical care and emergency departments (table D.8). National medical and diagnostics costs per casemix-adjusted separation would rise from $798 to $1065 if one-third of medical costs were recorded in operating rooms, critical care and emergency departments, and these were reallocated to the medical and diagnostics component (table D.9). Under this scenario, medical and diagnostics costs per casemix-adjusted separation for patients in public hospitals would still be $281 less than medical and diagnostic costs experienced by patients in private hospitals — a difference of around 21 per cent.

Table D.8 **Distribution of NHCDC pharmacy and medical costs for selected patient-costed public hospitals, by cost bucket, 2007-08[a]**

NHCDC cost bucket	*Pharmacy costs*	*Medical salaries and wages*
	Per cent	Per cent
Ward medical	–	61.2
Ward nursing	–	–
Non-clinical salaries	0.1	–
Pathology	0.2	0.9
Imaging	0.5	2.6
Allied health	–	0.1
Pharmacy[b]	76.4	0.1
Critical care	8.2	8.2
Operating rooms	12.1	19.4
Emergency departments	2.0	7.4
Supplies and ward overheads	–	–
Specialised procedure suites	0.5	0.2
Prostheses	0.1	–
Staff on-costs	–	–
Hotel	–	–
Depreciation	–	–
Total cost	100.0	100.0

[a] Includes patient-costed data from public hospitals in NSW , NT, QLD, NT, SA and TAS. Disaggregation of medical and pharmacy costs for other jurisdictions was not able to be obtained as they do not provide data at a sufficient level of disaggregation, or do not submit patient-costed data [b] Victorian pharmacy costs are only included in the pharmacy bucket and not in other buckets. – Nil or rounded to zero.

Source: DOHA (unpublished).

Table D.9 **Public hospital medical salaries and wages included in other NHCDC cost buckets, 2007-08**

Costs per casemix-adjusted separation	*NSW, QLD, SA, Tasmania, NT and ACT*[a]	*Australia*[b]
Diagnostics[c]	268	270
Ward medical	408	490
HCP medical and diagnostic charges	55	37
Medical salaries and wages included in General Hospital[d]	176	211
Medical salaries and wages included in Emergency[d]	47	56
Total medical and diagnostics costs	953	1065

[a] Percentage of medical costs included in general hospital and emergency for QLD, NSW, TAS, NT and SA (as presented in table D.8) is assumed to apply to the ACT. [b] Estimates are based on the assumption that the allocation of medical salaries and wages to other NHCDC cost buckets, as presented in table D.8, is consistent across all jurisdictions. [c] Diagnostics costs are NHCDC cost buckets for pathology and imaging. [d] Amounts calculated using proportions from table D.8. Components may not sum to total due to rounding.

Source: Productivity Commission estimates.

D.4 Cost indicators

Two commonly-used measures of hospital costs were estimated for this study:

- cost per casemix-adjusted separation — the average cost of treating a range of different diagnoses, after taking into account differences in the complexity of required treatments (casemix adjustment)
- cost per separation — the average cost of treating a group of patients with clinically-similar diagnoses.

Clinically-similar diagnoses were defined according to the widely-accepted system of AR-DRGs (box D.3). This classification system provides a clinically-meaningful way of relating types of patients treated to required resources (DOHA 2004). Individual DRGs represent a class of patients with similar clinical conditions who require similar hospital services (AIHW 2009a; DOHA, sub. 32).

Some participants were concerned that individual DRGs are not sufficiently homogeneous to enable like-for-like comparisons (for example, Queensland Health, sub. 27; Tasmanian Department of Health and Human Services, sub. 37; Women's and Children's Hospitals Australasia, sub. 21). It is inevitable that any patient classification system will have some heterogeneity within individual categories, as no single patient is identical to another, and so the question is whether such heterogeneity is significant and likely to prejudice any cost comparison.

Box D.3 Classifying episodes of care — Diagnosis-Related Groups

The Diagnosis-Related Group (DRG) system is a taxonomy of hospital outputs that is used to document, apportion and control costs in hospitals. The purpose of the DRGs is to relate the mix of patients treated, or casemix, to the resource demands and associated costs experienced by a hospital. Separations are categorised on the basis of three main principles:

- clinical meaning — diagnoses within each DRG are to be clinically similar
- resource homogeneity — treatment of diagnoses within each DRG should utilise a similar type and amount of resources
- exclusivity — diagnoses should only correspond to a single DRG.

The DRG system currently used in Australia reflects local clinical practice and is referred to as Australian Refined Diagnosis-Related Groups (AR-DRGs), with the latest version (6.0) released in 2008. The NHCDC and HCP data presented in this study use AR-DRG version 5.1.

A DRG system groups episodes of patient care into categories differentiated by factors such as main diagnosis, clinical procedures, gender, age, and the presence of additional diagnoses or complications. At the highest level, episodes of care are classified into a Major Diagnostic Category (MDC). Diagnoses in each MDC correspond to a single body system or cause of disease, broadly reflecting the specialty providing care. All possible principal diagnoses in the AR-DRG classification system fall into one of 23 mutually exclusive MDCs, and into one of 665 AR-DRGs.

Source: Bridges, Haas and Mazevska (1999); DOHA (2004); Erlandsen (2008).

The Commission notes that factors such as patient age, severity of conditions, and the presence of comorbidities, are included in the AR-DRG system, and so are, to some extent, controlled for. The AR-DRG system has been refined over a period of more than a decade with input from national, state and territory health departments so that only patients with similar clinical conditions and resource requirements are grouped into the same DRG (DOHA 2004).

The AR-DRG system only applies to admitted patients, and so it was not possible to compare costs for other hospital services. Admitted-patient services accounted for 71 per cent of the costs incurred by overnight acute hospitals in 2007-08 (AIHW 2009a).[4]

4 Victoria admits patients for treatments that other jurisdictions may administer as non-admitted (outpatient) services, such as chemotherapy and dialysis, and so Victoria may account for a disproportionate share of national costs for admitted-patient services.

The grouping of similar outputs by DRG, and casemix adjustment when comparing costs for more than one DRG, is an important step in making cost comparisons more meaningful. The details of casemix adjustment are outlined in box D.4.

Box D.4 **Cost per casemix-adjusted separation**

Casemix adjustment involves weighting the separations for each DRG by its relative complexity, and is often used to improve comparisons between different hospitals.

The complexity of an episode of care in the context of hospital costing refers to the expected resources that are to be used in treatment. The complexity of a DRG is measured by its relative cost weight — the average cost of that DRG across all relevant hospitals divided by the average cost of all DRGs.

The cost per casemix-adjusted separation is given as:

$$\frac{Total\ expenditure}{\sum_i Separations_i \times Relative\ cost\ weight_i}$$

where there are *i* number of DRGs.

The denominator in this expression is the number of casemix-adjusted separations and is used to adjust the number of separations for their relative complexity in calculating a per unit cost. Casemix adjustment can be performed at different levels of aggregation, such as by jurisdiction, region or size.

Source: AIHW (2009a).

D.5 Tax exemptions

Public and not-for-profit private hospitals are partially exempt from paying fringe-benefits tax (FBT) and are not required to pay payroll tax. Private not-for-profit hospitals are also entitled to income tax exemptions (including capital gains tax), and goods and services tax, stamp duty and land tax concessions. As ‘deductible gift recipients’ they are entitled to receive income tax deductible gifts and tax deductible contributions (KPMG 2009). These concessions can assist public and not-for-profit private hospitals in recruiting and retaining staff (Treasury 2008a). The terms of reference for this study require the Commission to take account of FBT exemptions when comparing costs.

The FBT and payroll-tax concessions mean that the cost of offering a given level of post-tax remuneration is likely to be greater for a for-profit hospital, than for a public or not-for-profit private hospital. That is, the concessions confer a cost advantage on public and not-for-profit private hospitals by effectively subsidising their labour costs.

As the cost of labour faced by public and not-for-profit hospitals is reduced by the tax concessions, this is likely to distort resource allocation. Reducing the price of labour relative to capital and other inputs for public and not-for-profit private hospitals provides an incentive for them to be more labour intensive than for-profit private hospitals that are not afforded these concessions. No adjustments for this distortion have been made in this study.

The Commission has, however, sought to ensure that costs are compared on a like-for-like basis by removing the additional tax burden that for-profit hospitals, compared to public and not-for-profit private hospitals, incur due to not having access to the FBT and payroll-tax exemptions.

Fringe-benefits tax exemption

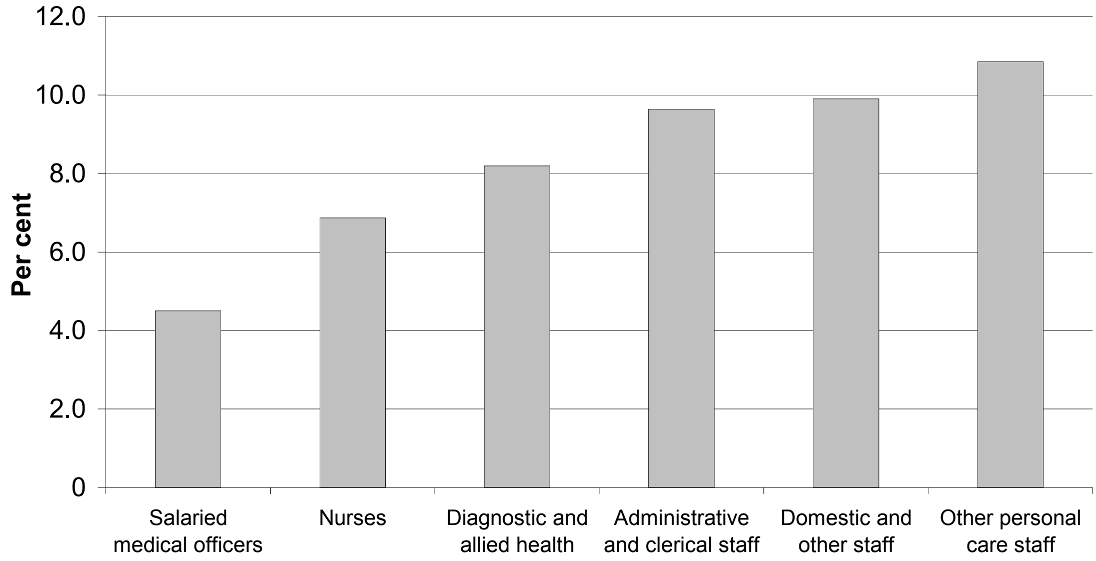
The fringe-benefits tax (FBT) exists to ensure that remuneration from employers is treated consistently, regardless of the form in which the income is received. It is paid by employers at the top marginal tax rate plus the Medicare levy (46.5 per cent).

The FBT exemption for public and not-for-profit hospitals can provide them with a cost advantage that aids in recruiting and retaining staff (Treasury 2008a). Individuals working for these hospitals are able to increase their post-tax remuneration by taking some of their pay package as fringe benefits. The exemption is capped at $17 000 per employee (ATO 2007). The cap prevents overuse, constrains the impact of the concession on competitive neutrality, and limits the foregone tax revenue to the Australian Government to $7905 per employee (46.5 per cent of $17 000).

However, there are a number of items that are excluded from the $17 000 cap on the FBT exemption for public and not-for-profit hospitals. These include meal entertainment (such as a doctor’s expenses on a restaurant meal at a social occasion), entertainment-facility leasing expenses and car parking. There is little information on the use of these uncapped FBT exemptions, and so the Commission has not been able to specifically adjust for them in its cost estimates.

The proportionate increase in post-tax remuneration that can be achieved by using the capped FBT exemption will depend on a worker’s pre-tax salary. Based on the average salaries of different occupations, the capped FBT exemption has the potential to increase post-tax remuneration by a greater percentage for other personal care staff compared to salaried medical officers (figure D.1). However, participants noted that the NSW Government has a policy of taking 50 per cent of the tax savings that public hospital employees in NSW would otherwise enjoy by taking part of their package as fringe benefits (for example, Mark Hanlon, sub. DR46).

Figure D.1 **Maximum effect of the capped fringe-benefits tax exemption on post-tax remuneration, by occupation[a]**



[a] Reduced tax as a percentage of average salaries of full-time equivalent staff in public acute and psychiatric hospitals. It is assumed that employees minimise their tax liabilities and realise the exemption up to the $17 000 cap.

Source: Productivity Commission estimates.

FBT payments are included in the NHCDC on-cost bucket (DOHA 2008c). However, it is not possible to separately identify FBT in the NHCDC data. The Commission therefore had to estimate the impact of the FBT exemption indirectly.

The capped FBT concession for public and not-for-profit private hospitals is estimated to have cost the Australian Government $270 million in foregone revenue in 2007-08 (Treasury 2008b). This was equivalent to around 1.4 per cent of the total wage bill of public and private not-for-profit hospitals in 2007-08 (AIHW 2009a, ABS 2008e).

As for-profit and not-for-profit private hospitals are not distinguished in the NHCDC, estimating and removing the ‘excess’ FBT incurred by for-profit hospitals required a number of adjustments. First, the amount by which the for-profit private hospital wage bill was to be reduced was estimated. This amount was then expressed as a proportion of the total wage bill of private hospitals (for-profit and not-for-profit hospitals combined), as these hospitals are not identified separately in either the NHCDC or the HCP datasets. The cost buckets that relate specifically to wages and salaries were then reduced by this percentage.

In estimating the percentage by which the private for-profit wage bill needs to be reduced, it was assumed that use of the capped FBT exemption is the same across both public and private not-for-profit hospitals. It was also assumed that if for-profit private hospitals had access to the capped FBT exemption, they would utilise it in the same way as public and not-for-profit hospitals.

The estimated total cost of the capped FBT exemption ($270 million in 2007-08) was first apportioned between public and private not-for-profit hospitals, according to the relative size of their total wage bills.[5] On this basis, around $246 million, or about 90 per cent, of the tax benefit from the capped FBT exemption, was estimated to have gone to public hospitals, and around $24 million — around 1.4 per cent of the total wage bill of private not-for-profit hospitals (ABS 2008e) — went to private not-for-profit hospitals (table D.10).

Table D.10 **Distribution of benefits from the capped FBT exemption by sector**

Hospital type	*Total wage expenditure*[a]	*Proportion of foregone FBT revenue*
	$m	%
Private		
For-profit	1 700 724	..
Not-for-profit	1 701 072	9
Public	16 410 900	91

[a] Total wage expenditure figures are from 2006-07, as private wage expenditure figures for 2007-08 are not currently available. .. Not applicable.

Source: ABS *Labour Price Index, Australia*, Cat. no. 6345.0; AIHW (2008b); Productivity Commission estimates.

If private for-profit hospitals had utilised the capped FBT exemption to the same extent as other hospitals, private for-profit hospitals would have received a tax benefit in the order of $24 million.[6] This amounts to around 0.7 per cent of the total wage bill for all private hospitals, and is the factor by which private hospital labour costs were reduced to take into account the differences in access to the capped FBT

5 Private hospital wage data were not available for 2007-08, so wage relativities for 2006-07 were used to apportion the 2007-08 FBT cost across public and private not-for-profit hospitals.

6 This is around 1.4 per cent of the wage bill for private for-profit hospitals. This calculation assumes that the employment behaviour of private for-profit hospitals would not have changed with access to the capped FBT exemption.

exemption. In particular, NHCDC cost buckets for ward medical, ward nursing and non-clinical salaries were reduced by 0.7 per cent for private hospitals. This averaging approach takes full account of the capped FBT disadvantage faced by the private for-profit sector by apportioning it across the entire private hospital sector.

Payroll taxes

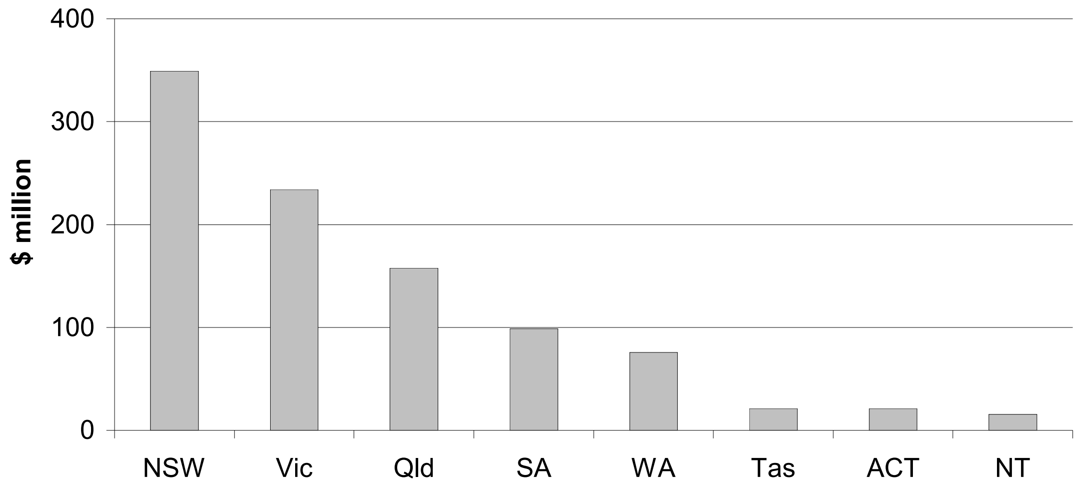
All states and territories levy a payroll tax on employers that have total wage and salary payments exceeding specified tax-free thresholds. As noted above, public and not-for-profit private hospitals are exempt from payroll tax.

The states and territories individually administer payroll taxes, so there are different tax rates and thresholds across jurisdictions. Payroll-tax rates range from 4.7 per cent in Queensland to 6.8 per cent in the ACT. The wage-bill threshold at which payroll taxes become payable range from a wage bill of $550 000 in Victoria to $1.5 million in the ACT.

The Commission was advised that payroll taxes are supposed to be excluded from the NHCDC data, and so the Commission did not adjust the data to reflect the different payroll-tax regimes applying to for-profit private hospitals relative to public and for-profit hospitals. It should, nevertheless, be noted that the impact of payroll-tax exemptions on labour costs is not trivial.

The payroll tax concessions represent a significant cost that is often not explicitly taken into account. As shown in figure D.2, the impact of payroll-tax exemptions on public hospitals is also likely to vary markedly between jurisdictions, depending on the tax rate applied. Across all jurisdictions, the concession is worth around $970 million for public hospitals alone. This represents around 5.4 per cent of the total wage and salary bill for public hospitals in Australia (AIHW 2009a).

Figure D.2 **Estimated benefit to public hospitals of payroll-tax exemptions, 2007-08[a]**



[a] Based on the number of full-time equivalent employees and total wage bill for each jurisdiction.

Source: ACT Revenue Office (2009a, 2009b); AIHW (2009a); State Revenue Office (Vic) (2009a, 2009b); Office of State Revenue (Qld) (2009a, 2009b, 2009c); Office of State Revenue (NSW) (2007, 2008), Revenue SA (2008, 2009), Office of State Revenue (WA) (2007); Department of Treasury and Finance (Tas) (2008a, 2008b); Territory Revenue Office (NT) (2008a, 2008b); Productivity Commission estimates.

D.6 Capital costs

The terms of reference require the Commission to take into account capital costs when comparing costs for clinically-similar procedures performed by public and private hospitals. Capital costs comprise two components:

- depreciation — the reduction in the value of an asset due to usage or obsolescence
- the user cost of capital (UCC) — the opportunity cost of funds tied up in the capital used to deliver services. That is, the return that could be generated if the funds tied up in the capital used to provide hospital services were employed in their next best use.

In most cases, depreciation is recorded at a DRG level in the NHCDC, and so identifying this cost has been relatively straightforward. In contrast, comparing the UCC on a like-for-like basis is difficult because it is not included in the NHCDC, and other data sources are limited by inconsistent collection methods and missing information. This reflects differences in the rationale for, and relative importance attached to, public reporting of the amount of capital used in the public, not-for-profit, and for-profit sectors.

Where capital costs are not available in the NHCDC, the Commission has largely drawn on the methodology and data that jurisdictions have for some years contributed to for national reporting of public hospital costs under the auspices of the Steering Committee for the Review of Government Service Provision (SCRGSP). The SCRGSP (2009) — comprising representatives from the Australian, state and territory governments — reported that, in 2006-07, capital costs accounted for around 10 per cent of the average cost per casemix-adjusted separation for inpatient services at major public acute hospitals.

The SCRGSP methodology for estimating the UCC of public hospitals involves calculating the return foregone on the next best investment, estimated at a rate of 8 per cent of the value of assets (box D.5). To ensure like-for-like comparisons in this study, the Commission has used the same approach when calculating the UCC for private hospitals.

Box D.5 **SCRGSP methodology for calculating public hospital capital costs**

The SCRGSP methodology for calculating capital costs for public hospitals is as follows:

- Asset values for land, buildings and equipment, and depreciation data for buildings and equipment are provided by state and territory governments
- The user cost of capital (UCC) for each asset class in each state is calculated by multiplying the value of the jurisdiction's assets by a UCC rate (8 per cent).
- The resulting capital cost (depreciation and UCC) for each asset class is then divided by the number of casemix-adjusted separations and multiplied by an 'admitted-patient cost proportion' to obtain a capital cost per casemix-adjusted separation for admitted patients. Asset values and depreciation data for Victoria and Western Australia are only for admitted patients and thus the admitted-patient cost proportion is one for these jurisdictions.
- The next step is to calculate a total capital cost (excluding land) per casemix-adjusted separation. This is done by adding the capital cost per casemix-adjusted separation for buildings and equipment, and subtracting interest payments per separation. Land is excluded, as differences in property values obscure the differences between how well hospitals are managed. Interest payments represent a UCC, and so are subtracted to avoid double counting.

Source: SCRGSP (2009).

The estimation of the UCC is considerably more difficult for private hospitals compared to public hospitals, as the asset values of private hospitals are not publicly available and need to be estimated. The absence of this information presents a considerable obstacle in estimating comparable and robust capital costs, particularly in the private sector. As detailed below, the asset values used to estimate the UCC for private hospitals were derived from investment and depreciation data collected by the ABS (2008e). However, this data may not cover all capital investment in private hospitals. As parties other than the private hospital operator invest in hospital capital, it is likely that the value of leased assets are not fully covered in asset estimates.

NSW Department of Health (sub. 41; sub. DR64) and Dr. John Deeble (sub. DR56) favoured a different approach in which profits were used to measure the UCC for private hospitals. Using profits to measure the UCC of private hospitals is likely to be misleading because many private hospitals are run on a not-for-profit basis. As noted by Catholic Health Australia, the large number of hospitals it represents are motivated by benefits other than just profits:

> Catholic hospitals also have a mission focus which is often reflected in providing a wider range of treatments, such as palliative care, than might be the case than if the hospital was purely focused on profit maximisation. It also means that some Catholic hospitals are located in geographic regions which might not necessarily be attractive to for-profit operators. (sub. 20, p. 2)

A further problem with the approach suggested by NSW Department of Health and Dr. Deeble is that it confuses profits recorded for accounting purposes with the economic concept of the UCC. Accounting profits measure the difference between revenue and the amounts paid for inputs, rather than their opportunity costs. Two companies could use identical amounts of capital — and hence have the same UCC — but record very different profits for accounting purposes because of differences in their use of debt and rented capital items.

Nevertheless, despite using a different methodology, NSW Department of Health and appear to have reached a similar conclusion to that found by the Commission. In particular, NSW Department of Health (sub. 41) estimated that the average amount of capital used per bed in public hospitals is much higher than in private hospitals ($388 000 versus $244 000 per bed). The Commission's experimental estimates also show that public hospitals have a higher capital cost per casemix-adjusted separation than private hospitals (chapter 5).

Capital costs for public hospitals

Average depreciation costs are included in the NHCDC by DRG for all jurisdictions except Victoria. However, the data for Queensland exclude building depreciation, which accounts for the majority of depreciation in other jurisdictions.

The depreciation values reported by the SCRGSP (2009) for Victorian and Queensland public hospitals were used to approximate average depreciation by DRG for these jurisdictions. To reflect that the NHCDC is a sample of hospitals, the reported depreciation values for Victorian and Queensland hospitals were multiplied by the percentage of public separations in the NHCDC for each jurisdiction. These total depreciation amounts were then inflated to 2007-08 levels using a state, territory and local government gross fixed capital formation index published by the AIHW (2009c). Depreciation was apportioned across DRGs using a weighted average of the other jurisdictions' depreciation profiles, using weights were based on the jurisdiction's share of total separations.

It is unclear whether leasing and interest costs are included in the NHCDC cost buckets for depreciation and/or ward supplies and other overheads. The NHCDC Hospital Reference Manual states that costs associated with major leases are to be grouped with corporate overhead costs and included in the ward supplies and other overheads cost bucket (DOHA 2008c).[7] The treatment of leasing and interest-related costs is also likely to differ between sectors and jurisdictions.

The UCC for each jurisdiction was based on the 2006-07 admitted-patient UCC for buildings and equipment (minus interest payments) published by the SCRGSP (2009). To reflect the fact that the NHCDC only represents a sample of all hospital episodes, the UCC figure for each jurisdiction was multiplied by the percentage of that jurisdiction's public-hospital separations that were included in the NHCDC. These UCC figures were then inflated to 2007-08 values using a state, territory and local government gross fixed capital formation index published by the AIHW (2009c). To obtain an average UCC by DRG for each jurisdiction, the estimated total UCC was allocated according to the proportion of a jurisdiction's public hospital depreciation attributed to each DRG.

The reported public hospital asset values on which the UCC is derived suggest that Australian public hospitals had assets worth approximately $21.9 billion in 2007-08. NSW Department of Health (sub. 41) noted that this figure is consistent with work carried out by Dr. Deeble for the governments of Victoria, Queensland and South Australia over the last ten years. Nevertheless, NSW Department of Health (sub. 41, p. 3) observed that 'nobody knows exactly how much capital is currently used by the public hospitals'. This is partly due to inconsistent accounting practices regarding depreciation and the valuation of assets among governments. This might explain why the public hospital assets that Victoria reports to the SCRGSP seem to be an underestimate when compared to those of New South Wales and Queensland (figure D.3).

7 These corporate costs are allocated across different DRGs on the basis of bed days.

The use of public-private partnership arrangements, and the contracting out of public-hospital services to private operators, may lead to an understatement of assets used to provide public-hospital services in some jurisdictions.

Figure D.3 **Public hospital asset values (excluding land), 2007-08[a]**

[a] Asset values provided to SCRGSP by Victoria and Western Australia only apply to admitted patients. These asset values have been adjusted to apply to both admitted and non-admitted patients using the admitted-patient cost proportion. All asset values have been inflated to 2007-08 levels using a state, territory and local government gross fixed capital formation index published by the AIHW (2009c).

Source: SCRGSP (2009).

Data constraints prevented the calculation of the UCC estimates by region or hospital size. For these disaggregations, the Australia-wide UCC for public hospitals was apportioned across groupings by the number of casemix-adjusted separations.

When disaggregating by hospital size or region, the estimates of average depreciation for public hospitals by DRG do not include Victorian depreciation data or Queensland building depreciation data — since neither are reported in the NHCDC — and thus are understated.

Capital costs for private hospitals

Depreciation values for acute overnight private hospitals by DRG are included in the NHCDC.

Asset values are currently not reported for acute overnight private hospitals, making the calculation of the UCC difficult. The Commission estimated asset values for private hospitals from investment and depreciation data collected by the

ABS (2008e). The estimation method involved a perpetual inventory model similar to that used by Webster et al. (1998) (box D.6). Using this method the Commission estimated an asset value for acute overnight private hospitals, based on 2003-04 to 2006-07 data on capital expenditure and depreciation from the ABS (2008e).[8] The resulting regression estimates indicated that the average rate of depreciation for private hospitals was approximately 6 per cent per annum.

Setting the value of the investment time horizon variable, *H*, between 15 and 20 years seems to be appropriate, because the resulting annual amounts of investment before 2003-04 are similar to the values for private hospitals between 2003-04 and 2006-07. This would result in an estimated total value of assets for acute overnight private hospitals of between $3.5 billion and $4.0 billion in 2006-07. After inflating the value of assets to 2007-08 levels using the private gross fixed capital formation index (AIHW 2009c), this would imply a range of between $3.6 billion and $4.1 billion for 2007-08.

An investment time horizon of 17 years was used to estimate private hospital asset values, resulting in an estimate of approximately $3.9 billion for 2007-08. A UCC estimate for all Australian acute overnight private hospitals was then calculated by multiplying the estimated asset value by the UCC rate. The UCC rate used is 8 per cent, which is the rate used by the SCRGSP (2009).

As the ABS data are from a census of all acute overnight private hospitals, the UCC estimate was reduced using separation data so that it was in proportion to the sample in NHCDC data. No inpatient admitted-patient cost proportion was available for private hospitals, and so it was assumed that the admitted-patient cost proportion for acute overnight private hospitals was 100 per cent. The Commission acknowledges that this assumption is likely to overstate the UCC for admitted-patient services in private hospitals.

The national estimate of the UCC was apportioned to private hospitals in each jurisdiction by the proportion of total gross capital expenditure (minus land) in each jurisdiction between 2002-03 and 2006-07 (ABS 2008e). Finally, the UCC values were apportioned to individual DRGs according to the proportion of a jurisdiction's total private hospital depreciation attributable to each DRG.

The capital costs relating to diagnostic services are not included in the aforementioned calculation of private hospital capital costs as private hospitals

8 Gross capital expenditure was used as a proxy for net capital expenditure (gross capital expenditure *less* the trade-in values of replaced items and receipts for sales of replaced items) because the latter was not available. Gross capital expenditure on land was excluded in the estimation of asset values.

generally do not own the diagnostic equipment used in their hospital. However, the capital costs for this equipment are included in medical and diagnostics costs as the HCP charge data used implicitly incorporates a fee to cover capital costs.

As was the case for public hospitals, the UCC estimates by region or hospital size were calculated by apportioning the Australia-wide UCC for private hospitals across groupings by the number of casemix-adjusted separations.

Box D.6 **Estimating asset values**

The following example described by Webster et al. (1998), assumes capital prices are fixed, straight line depreciation, and constant annual amounts of net investment prior to the base period. Furthermore, it is assumed that:

I_n is capital expenditure in year n

D_n is depreciation in year n

K_n is the capital stock in year n

d is the rate of depreciation

K_0 is the base period capital stock

D_0 is the (constant) annual amount of depreciation on the base period capital stock.

It is also assumed that capital investment occurs in the middle of the year and thus the resulting capital depreciates only for half of that year. Therefore, the following relationships hold:

$$K_1 = K_0 - D_0 + I_1 \times (1 - d/2)$$
$$D_1 = D_0 + I_1 \times d/2$$
$$K_n = K_{n-1} + I_n \times (1 - d/2) - D_0 - d\sum_{i=1}^{n-1} I_i$$
$$D_n = D_0 + I_n \times d/2 + d\sum_{i=1}^{n-1} I_i$$

(continued)

Box D.6 (continued)

Because the values for I_t and D_t (for t = 1,...,n) are known, the equations relating to depreciation all take the form:

$y_t = D_0 + x_t \times d$

where y_t is D_t and x_t is I_t.

It is therefore possible to estimate D_0 and d by regression.

Next, it is assumed that the investments that contributed to the base period capital stock occurred in equal annual amounts over some (unknown) time horizon. For a given time horizon, H, the amount of annual investment can then be calculated and the relations above can be used to calculate the capital stock for subsequent years.

Source: Webster et al. (1998).

Benchmarking against asset data for major hospital groups

To assess whether the estimated \$3.5–4.0 billion range for the total value of assets for acute overnight private hospitals for 2006-07 was plausible, published data for two major private hospital operators — Ramsay Health Care and Healthscope — were examined.

Healthscope (2007) reported that it had property, plant and equipment (excluding land) worth \$560 million at 30 June 2007. It was estimated that Ramsay Health Care had property, plant and equipment (excluding land) worth \$990 million at the same point in time.[9]

Both organisations have only a few free-standing day facilities and these do not account for a significant share of total assets (Ramsay Health Care, pers. comm. 23 September 2009; Healthscope, pers. comm. 24 September 2009). Therefore, the value of acute overnight private hospitals (excluding land) owned by both Ramsay Health Care and Healthscope is considered to be approximately \$1.55 billion in 2006-07.

9 Ramsay Health Care (2007) reported that it had property, plant and equipment worth \$1.16 billion in 2006-07, but does not separately publish the value of its land. Approximately 15 per cent of the total assets of both Healthscope (2007) and Australian public hospitals (SCRGSP 2009) are reported to be attributable to land. If the same proportion applied to Ramsay Health Care, then it would have property, plant and equipment worth \$990 million. This does not include Ramsay's UK hospital operations, as they were purchased in November 2007, but it does include the three hospitals it owns in Indonesia.

It is estimated that Ramsay Health Care and Healthscope accounted for around 48 per cent of acute overnight private hospital separations in 2006-07.[10] If it is assumed that the cost of capital per separation was similar across all private hospital providers, then this would imply that the value of all acute overnight private hospital assets was approximately $3.23 billion.

However, this is likely to be an underestimate of the actual value of acute overnight private hospitals because the value of property, plant and equipment reported in the annual reports of both Healthscope and Ramsay Health Care do not actually represent the market value of these assets, but are more reflective of the cost incurred when the assets were purchased, less depreciation (Ramsay Health Care, pers. comm. 23 September 2009; Healthscope, pers. comm. 24 September 2009).

While the market value of assets is not published for either company, it is possible to infer an upper bound using the company's enterprise value (box D.7). The enterprise value of acute overnight private hospitals (excluding land) is estimated to be about $9 billion.[11] If this were an estimate of the total assets it would mean that the value of each business (goodwill) is equal to zero, which is not plausible. Indeed, the majority of the difference between the upper bound and the estimated value of assets (excluding land) is likely to be attributable to the value of the business.[12]

---

[10] According to Ramsay Healthcare (2009), it currently admits over 750 000 patients per annum in Australia. Between 2005-06 and 2007-08, admissions in Ramsay Health Care hospitals rose by 4.35 per cent per annum (Ramsay Health Care 2007, 2008). Assuming a similar growth rate in 2008-09, it is estimated that the number of separations in Ramsay Health Care hospitals was approximately 690 000 in 2006-07. Approximately 450 000 separations were recorded in Healthscope hospitals in 2006-07 (Healthscope, pers. comm. 1 October 2009). Australian acute overnight private hospital separations reported by the AIHW (2009) were 2 371 000 in 2006-07, implying an estimated market share for Ramsay Health Care and Healthscope of around 48 per cent of all private hospital separations.

[11] At 30 June 2007, Ramsay Health Care had a market capitalisation of approximately $1.94 billion and net debt worth approximately $730 million. It therefore had an enterprise value of approximately $2.67 billion. At 30 June 2007, Healthscope had a market capitalisation of approximately $1.24 billion and net debt worth approximately $550 million. It therefore had an enterprise value of approximately $1.79 billion. Assuming a market share for Ramsay Health Care and Healthscope of approximately 48 per cent, the upper bound of the enterprise value of all overnight acute private hospitals in Australia (excluding land) is approximately $9.3 billion.

[12] When Ramsay Health Care bought Affinity Holdings in 2005, Affinity had an enterprise value of approximately $1.4 billion. This included property, plant and equipment of $820 million at market value, implying the market value of the business was approximately $580 million, or 41 per cent of the enterprise value. The proportion of a firm's enterprise value that is attributable to the market value of the business will differ between companies. However, if this same percentage was applied to the estimated enterprise value for all acute overnight private hospitals, it would imply that the total asset value of acute overnight private hospitals in Australia was approximately $5.5 billion.

Box D.7 Enterprise value

The enterprise value of a company is an indicator of how the market values the company. It can be represented as follows:

$$EV = MC + D$$

where EV is enterprise value, MC is market capitalisation (share price $\times$ no. of ordinary shares) and D is the net debt (short term debt + long term debt – cash – cash equivalents).

That is, EV is equal to the company's market capitalisation — its share price multiplied by the number of shares — plus its net debt (debt minus cash and cash equivalents).

The market value of a company (as estimated by enterprise value) can broadly be considered to consist of the market value of its fixed assets and the market value of the business (including goodwill).

The difference between the value of property, plant and equipment and the enterprise value will be largely attributable to the sum of the:

- market value of the business (including goodwill)
- difference between reported and market values of property, plant and equipment.

Source: McClure (2004).

Another reason why the Commission's estimate of $3.5–4.0 billion for the value of acute overnight private hospitals might be an underestimate is the use of operating leases. While the value of hospitals that are operated under finance leases are included in property, plant and equipment, the value of hospitals that are operated under operating leases are not. Both Ramsay Health Care and Healthscope operate a small number of hospitals under operating leases (Ramsay Health Care, pers. comm. 23 September 2009, Healthscope, pers. comm. 24 September 2009). However, some of these hospitals are operated as public hospitals. Furthermore, the Commission understands that most of the hospitals with operating leases are relatively small. Therefore, the Commission is of the view that not including operating leases is unlikely to result in an underestimation of overnight acute private hospital asset values of more than a few hundred million dollars.

Dr. Deeble (sub. DR56) calculated the implied depreciation rates for public and private hospitals based on estimates prepared for this study's Discussion Draft and concluded that the depreciation rates were significantly different. However, these rates were not based on the same depreciated asset values of public and private hospitals used in the calculation of costs for this study's Discussion Draft. Specifically, Dr. Deeble reverse-engineered the total UCC for both public and private hospitals using the 8 per cent UCC rate, but did not appear to adjust for interest payments that are removed in the calculation of the UCC (box D.5). The depreciation rates implicit in the capital cost calculations detailed in this report are 4.52 per cent and 8.18 per cent for public and private hospitals respectively.

In conclusion, given the published data of Healthscope and Ramsay Health Care and the issues of operating leases and market valuations, the estimate of between $3.5–4.0 billion for the value of acute overnight private hospitals may be an underestimate of the actual asset value. As noted previously, the estimated value of public-hospital assets may also be underestimated due to under-reporting of capital used in public-private partnership arrangements, and the contracting out of public-hospital services to private operators. The approaches used to estimate capital costs and apportion them across DRGs are summarised in table D.11. The estimated capital costs by jurisdiction are reported in table D.3.

Table D.11 **Summary of sources and methods used to estimate capital costs**

	Public hospitals	*Private hospitals*
Cost of capital		
Depreciation	• NHCDC (DOHA, unpublished) for all states except Victoria • Victorian depreciation values sourced from SCRGSP (2009)	• NHCDC (DOHA, unpublished)
User cost of capital	• SCRGSP (2009)	• Commission estimates of private hospital asset values, based on ABS (2005, 2006, 2007, 2008).
Apportioning across DRGs		
Depreciation	• NHCDC for all states except Victoria • Victorian depreciation values allocated across DRGs on the basis of a weighted average of the other jurisdictions based on separations.	• NHCDC
User cost of capital	• UCC values apportioned according to the proportion of total depreciation associated with each DRG.	• UCC values apportioned according to the proportion of total depreciation associated with each DRG.

Table D.12 **Estimated capital costs per casemix-adjusted separation, 2007-08[a]**
Dollars

	NSW	*Vic*	*Qld*	*SA*	*WA*	*Tas, NT & ACT[b]*	*Australia*
Public hospitals							
User cost of capital per separation	290	212	390	252	237	301	279
Depreciation per separation	148	147	170	129	123	146	147
Total cost of capital per separation	439	359	560	381	359	447	426
Private hospitals							
User cost of capital per separation	97	94	104	69	129	126	100
Depreciation per separation	113	145	118	89	152	219	130
Total cost of capital per separation	210	240	223	158	281	345	230

[a] Australian totals may not add due to rounding. [b] Data for Tasmania, the Northern Territory and the ACT are aggregated to protect the confidentiality of the small number of hospitals in each of these jurisdictions.

Source: Productivity Commission estimates.

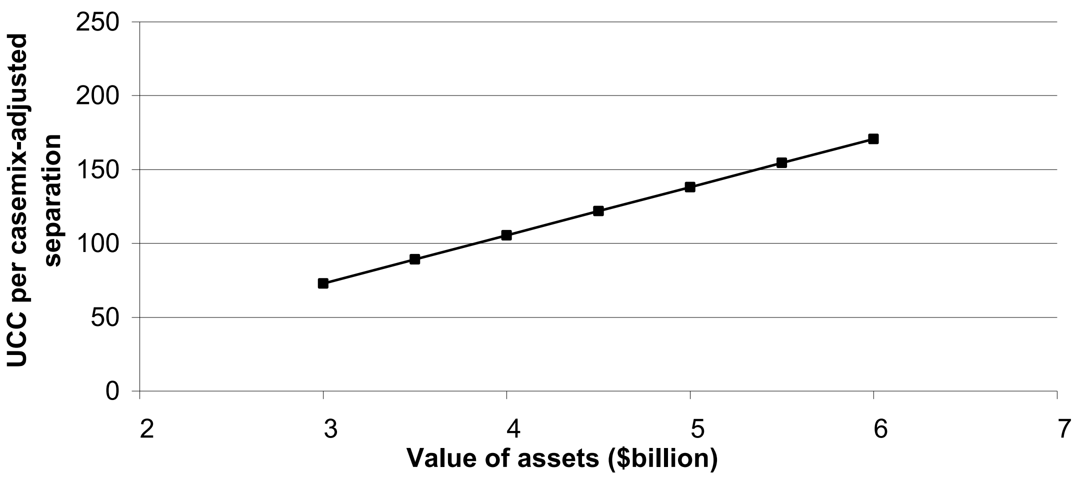
Sensitivity analysis of public and private sector asset values

Because of the considerable uncertainty around the capital costs presented in this report (especially those based on private hospital and public hospital asset values), the Commission undertook a sensitivity analysis to analyse how different asset values would alter the UCC per casemix-adjusted separation. As previously discussed, the Commission considers that its estimates of private hospital asset values could be underestimated, while there are also some questions regarding the estimates of public hospital asset values. It was therefore thought useful to examine the implications of varying asset values.

NSW Department of Health (sub. 41) estimated that the value of acute overnight private hospitals was approximately $6 billion in 2007-08, compared to the Commission’s estimate of around $3 billion. The sensitivity analysis was therefore done for a range of $3–6 billion for the value of acute overnight private hospitals. For public hospitals, a range of $18–24 billion was considered sufficient, given the possible data inconsistencies. The UCC per casemix-adjusted separation was calculated for both public and private hospitals for different asset values within these ranges.

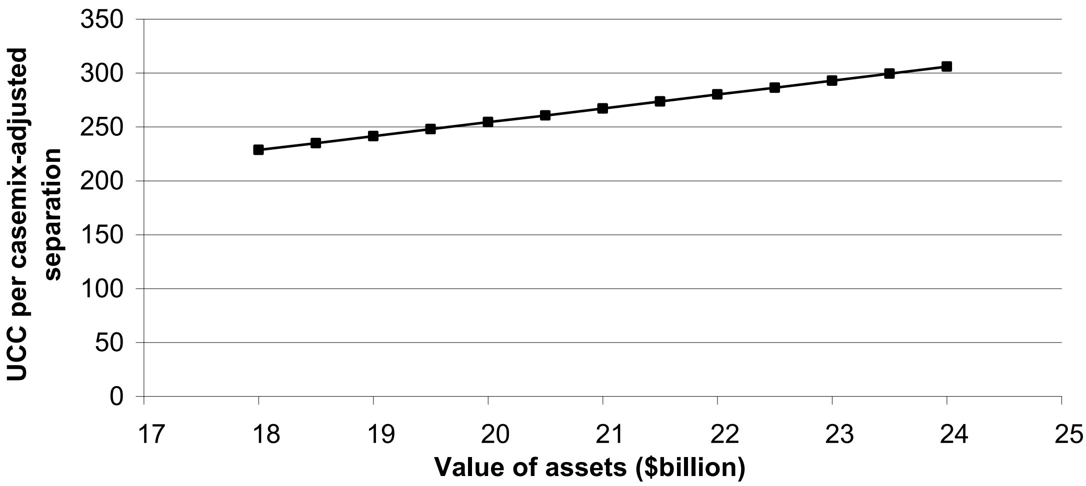
The Commission found that, if public hospitals assets were equal to $24 billion and private hospital assets were equal to $6 billion, then there would be a difference of almost $135 between the UCC per casemix-adjusted separation for public and private hospitals (figures D.4 and D.5).

Figure D.4 **Sensitivity analysis for private hospital user cost of capital**



Source: Productivity Commission estimates.

Figure D.5 **Sensitivity analysis for public hospital user cost of capital**



Source: Productivity Commission estimates.

In contrast, if private hospital asset values were equal to $6 billion, and public hospital asset values were equal to $18 billion, then the difference in UCC per casemix-adjusted separation would still be approximately $55.

In conclusion, the sensitivity analysis showed that, for a range of different asset values, the capital cost per casemix-adjusted separation in public hospitals is consistently higher than in private hospitals.

D.7 Relative complexity

The large volume of renal dialysis patients in public hospitals has a major impact on the relative complexity of the public hospital casemix. Renal dialysis admissions account for around 19 per cent of all public hospital separations, and have a relatively low cost weight (table D.13). In contrast, around 3.7 per cent of private hospital admissions are for renal dialysis. Calculating average cost weights without renal dialysis separations increases the average public hospital cost weight from 0.96 to 1.01 and decreases the private hospital cost weight from 1.09 to 0.98 (table D.14).

Table D.13 **Renal dialysis and chemotherapy separations as a percentage of all separations by sector, 2007-08**[a]

	NSW	*Vic*	*Qld*	*SA*	*WA*	*Tas, NT & ACT*[b]	*Australia*
Public hospitals							
Renal Dialysis (L61Z)	19.5	18.2	17.9	15.7	18.1	29.2	19.0
Chemotherapy (R63Z)	0.2	5.8	3.1	0.0	5.6	1.8	2.8
Private hospitals							
Renal Dialysis (L61Z)	3.7	0.0	8.7	0.0	0.0	0.0	3.7
Chemotherapy(R63Z)	5.7	9.6	3.3	10.7	10.7	8.0	7.1
All hospitals							
Renal Dialysis (L61Z)	15.8	13.1	14.4	11.3	11.8	23.0	14.6
Chemotherapy (R63Z)	1.5	6.9	3.2	3.0	7.4	3.1	4.1

[a] Renal dialysis and chemotherapy separations are expressed as a percentage of all separations in this cost analysis. A number of DRGs were not included in the cost analysis, as outlined in section D.1. [b] Data for Tasmania, the Northern Territory and the ACT are aggregated to protect the confidentiality of the small number of hospitals in each of these jurisdictions.

Source: DOHA (unpublished).

Another DRG with a high volume and low cost is chemotherapy (R63Z). It accounts for around 2.8 per cent of public hospital separations and 7.1 per cent of private hospital separations. Removing this chemotherapy DRG from calculations, in addition to the prior removal of all renal dialysis cases, causes the relative complexity of treatment across the two hospital sectors to converge to a relative cost weight of 1.00 for both public and private hospitals.

Table D.14 **Impact of renal dialysis and chemotherapy separations on average cost weights by sector, 2007-08[a]**

	NSW	*Vic*	*QLD*	*SA*	*WA*	*Tas, NT & ACT*[b]	*Australia*
Public hospitals							
All DRGs with > 30 seps	1.01	0.92	0.96	1.01	0.94	0.85	0.96
All DRGs with > 30 seps, without L61Z[c]	1.07	0.95	1.00	1.02	0.97	1.00	1.01
All DRGs with > 30 seps, without L61Z and R63Z[d]	1.03	0.97	0.99	0.98	0.99	0.98	1.00
Private hospitals							
All DRGs with > 30 seps	1.13	1.08	1.09	1.07	1.04	1.00	1.09
All DRGs with > 30 seps, without L61Z[c]	1.02	0.94	1.02	0.93	0.90	0.88	0.98
All DRGs with > 30 seps, without L61Z and R63Z[d]	1.03	0.98	1.01	0.98	0.95	0.90	1.00

[a] Average cost weight is the ratio of the average cost of all separations in a jurisdiction, relative to all separations. [b] Data for Tasmania, the Northern Territory and the ACT are aggregated to protect the confidentiality of the small number of hospitals in each of these jurisdictions. [c] L61Z refers to separations involving renal dialysis. [d] R63Z refers to separations involving chemotherapy.

Source: Productivity Commission estimates.

The DRG system includes adjacent categories (adjacent DRGs, or ADRGs) indicating the presence of comorbidities or complications which can increase the expense associated with treatment.[13] Less complex DRGs can be thought of as 'bounded' in their complexity — separations involving greater resource consumption should be categorised as belonging to an DRG corresponding with a higher level of resource consumption. DRGs that end with the suffix 'A' are 'unbounded' in their potential resource consumption in that they involve severe or catastrophic complications or comorbidities, and by definition they correspond to the highest consumption of resources within the ADRG (DOHA 2004). DRGs ending with the suffix 'Z' are similarly unbounded in that they are not split by resource requirements. In contrast, DRGs ending with a 'B', 'C' or 'D' are bounded in that there is a higher category of resource usage.

If there was a noticeable difference between sectors in the 'complexity' within more complex DRGs, it would be expected that removing the unbounded DRGs from the cost analysis may bring the comparative estimates of cost per casemix-adjusted separation closer together.

13 For example, in AR-DRG version 5.1, the ADRG (F62) relating to heart failure includes two 'splits' indicating different levels of resource consumption — one involving heart failure with catastrophic complications or comorbidities (F62A), and one without (F62B).

Table D.15 suggests that there may be some difference in average cost per casemix-adjusted separation for different levels of resource requirements. For the most complex DRGs (suffix 'A'), the difference between public and private average costs is around 8 per cent of the average public cost. For other DRG levels, the difference is generally less, with the exception of 'D' DRGs, of which there are only four included in this analysis.

Table D.15 **Cost per casemix-adjusted separation for adjacent DRGs, Australia, 2007-08[a]**

	Number of DRGs	*Public hospitals*	*Private hospitals*	*Difference*
DRGs with 'A' suffix	194	4 346	3 971	375
DRGs with 'B' suffix	197	4 259	4 267	- 8
DRGs with 'C' suffix	50	4 241	4 301	- 60
DRGs with 'D' suffix	4	4 345	3 855	490
DRGs with 'Z' suffix	147	4 330	4 149	180

a DRGs with less than 30 separations in both public and private hospitals are excluded. Costs are casemix-adjusted using combined DRG-level costs weights for both public and private hospitals.

Source: Productivity Commission estimates.

Table D.16 shows that, while there may be some difference in complexity, it does not impact significantly on overall relative costs of public and private hospitals. Removing those DRGs that are unbounded in their complexity does not significantly impact on the cost difference between sectors.

Table D.16 **Cost per casemix-adjusted separation for adjacent DRGs, Australia, 2007-08[a]**

	Public hospitals	*Private hospitals*	*Difference*
All DRGs	4 302	4 172	130
DRGs with 'A', 'B', 'C', or 'D' suffix	4 291	4 285	106
DRGs with 'B', 'C', or 'D' suffix	4 255	4 274	-19

a DRGs with less than 30 separations in both public and private hospitals are excluded. Costs are casemix-adjusted using combined DRG-level costs weights for both public and private hospitals.

Source: Productivity Commission estimates.

D.8 Prostheses costs

There are significant differences between the public and private prostheses costs. This is particularly apparent at a DRG level. Of the 20 DRGs with the greatest average cost per separation, 19 have a public hospital prosthesis cost that is less than 90 per cent of the private cost, and seven of the 20 have a public hospital prosthesis cost that is less than 50 per cent of the private cost (table D.17). Across the twenty DRGs presented, the public prosthesis cost is around 55 per cent that of the private prosthesis cost.

It is important to recognise that on the basis of the cost data presented, no firm conclusions can be drawn as to whether the source of the difference is differential pricing or the use of different prostheses across sectors. This is due to the lack of available price comparisons across sectors for identical items. BUPA Australia (2004) have previously presented evidence suggesting that suppliers of prostheses charge different unit prices across the two sectors, stating that the cost faced by the public sector is 55 per cent of that paid by BUPA Australia themselves for the same item.

A number of cardiac procedures also display vastly different prosthesis costs across sectors, although this may be both a product of different pricing and use of different products across sectors. For example, the average public sector prosthesis cost associated with percutaneous coronary intervention without acute myocardial infarction involving the use of stents (DRG F15Z) is estimated to be around one quarter of the prosthesis cost in the private sector. However, use of drug-eluting stents — which may cost three to four times as much as bare-metal stents — is higher in the private sector than in the public sector, and is a likely driver of the sectoral differences in prosthesis costs for this procedure (Harper 2007; McLean and Clark 2008).

However, a wider choice of more expensive devices is not necessarily the sole cause of higher prostheses prices in the private sector. The two DRGs with the costliest prostheses in the private sector (F01A and F01B) involve the implantation or replacement of an automated implantable cardioverter-defibrillator (AICD) (table D.17). As specified by the Prostheses List, benefits that are payable by private health funds for these devices on the list range from \$36 400 up to \$52 000 (DOHA 2009d). Given that the average prostheses cost for these DRGs is between \$12 100 and \$13 900 in the public sector, there appears to be a difference of over \$22 000 between the average prosthesis cost in the public sector and the least costly device available in the private sector.[14]

[14] The Commission understands that prosthesis costs for these DRGs are not necessarily restricted to the AICD, but also involve a number of other costly components. Public costs mentioned above include these components, whereas the private cost refers only to the AICD.

Table D.17 **Prosthesis costs for selected DRGs, 2007-08**[a]

DRG	Description[b]	Public sector: Separations	Public sector: Average cost	Private sector: Separations	Private sector: Average cost
		No.	$	No.	$
F01A	Implantation or replacement of AICD, total system w cs cc	1 079	13 849	652	55 490
F01B	Implantation or replacement of AICD, total system w/o cs cc	885	12 154	957	49 753
I06Z	Spinal fusion w deformity	314	16 936	257	28 546
D01Z	Cochlear implant	370	21 043	276	21 918
F02Z	AICD component implantation/replacement	177	7 880	79	18 638
I01Z	Bilateral or multiple major joint procedures of lower extremity	576	9 533	1 544	16 848
I09A	Spinal fusion w cs cc	813	10 294	981	16 742
F12Z	Cardiac pacemaker implantation	4 959	3 225	4 231	13 368
I03A	Hip revision w cs cc	484	7 760	537	12 990
I09B	Spinal fusion w/o cs cc	1 516	6 761	4 577	12 939
I11Z	Limb lengthening procedures	124	3 589	56	10 971
I03C	Hip replacement w/o cs cc	7 091	5 605	10 128	10 838
F17Z	Cardiac pacemaker replacement	1 819	3 286	1 682	10 670
I03B	Hip replacement w cs cc or hip revision w/o cs cc	5 440	4 498	3 591	9 599
I05Z	Other major joint replacement and limb reattachment procedures	1 145	4 964	1 731	8 790
I04Z	Knee replacement and reattachment	10 907	6 010	17 464	8 443
F03Z	Cardiac valve proc w CPB pump w invasive cardiac inves	371	5 780	579	6 706
F04A	Cardiac valve proc w CPB pump w/o invasive cardiac inves w cs cc	1 672	4 965	1 212	6 578
F04B	Cardiac valve proc w CPB pump w/o invasive cardiac inves w/o cs cc	814	4 511	874	5 485

[a] Table includes 20 DRGs with the highest prosthesis costs per separation. Public and private sectors share the same top 20 DRGs. [b] w: with. w/o: without. cc: complications and comorbidities. cs: catastrophic or severe. proc: procedure. AICD: automated implantable cardioverter-defibrillator CPB: cardiopulmonary bypass. inves: investigation.

Source: Productivity Commission estimates.

D.9 Costs for patients funded by the Department of Veterans' Affairs

The Department of Veterans' Affairs (DVA) is responsible for providing health care to veterans and their dependants on behalf of the Repatriation Commission (box D.8). In 2006-07, DVA-funded patients represented around 2.8 per cent of all separations in public hospitals and 7.1 per cent of separations in private hospitals

(AIHW 2008b). As a client of both the public and private hospital sectors across Australia, DVA's experience could provide useful insights into the relative performance of the two sectors.

Box D.8 Health care arrangements for veterans and their dependants

The Repatriation Commission is responsible under the *Veterans' Entitlements Act 1986* (Cwlth) for the provision of health services to eligible veterans and their dependants. This responsibility is administered on behalf of the Repatriation Commission by the Department of Veterans' Affairs (DVA) and covers a range of available health care, including general practitioner and allied-health treatment, in-home care and support, and hospital care in both public and private hospitals.

In providing these services, over $4 billion was spent in the last year, with $1.7 billion being spent on hospital services. In funding veteran health care, DVA covers the full cost of treatment — there are no 'gap' payments made by veterans.

Currently there are around 272 000 veterans that are eligible for health services provided by the Repatriation Commission. The Repatriation Commission notes that there is a high risk of complications developing over the course of hospitalisation of veterans given their age profile — 91 per cent of eligible veterans are over the age of 55, and 67 per cent over the age of 75. This risk is a potentially significant burden in terms of cost to DVA.

Source: Repatriation Commission (sub. 39).

The Commission obtained data from DVA on the costs it has incurred in procuring hospital services for veterans and their dependants. DVA identified the top 20 DRGs in terms of total cost between 2003-04 and 2006-07.[15]

A number of study participants cautioned that DVA patients are not necessarily representative, with the procedures they undergo — and the difficulties associated with them — likely to differ from those of the broader population (for example, ACT Health, sub. DR52). This may be the case where the DVA patient cohort is comprised exclusively of veterans. However, given that more than 50 per cent of DVA's patients are dependents — typically spouses of veterans, and often without war-related illnesses — it is reasonable to expect that there are commonalities with the general population. Procedures common to DVA patients could also be common to those not eligible for DVA-provided health care but of similar demographic profile. Further, DVA patients are often treated in the same hospitals and by the same clinicians as other private patients. As such, the DVA data may provide a

[15] Excluding mental health and rehabilitation DRGs and services involving sub-acute and non-acute care.

broad indication of the robustness of the Commission's general findings based on the NHCDC and HCP.

One way of assessing how similar DVA and other patients are is to compare their average length of stay (ALOS) for a given DRG. ALOS is admittedly a crude measure of patient heterogeneity, as it can be affected by a range of factors, including comorbidities, age-related factors, clinical practice, and purchasing/funding models. Nevertheless, a higher ALOS might be expected for DVA patients because they tend to be older than the general population with a higher incidence of comorbidities. Among the 20 DRGs for which the Commission obtained DVA data, almost all had a higher ALOS for DVA patients than for the NHCDC sample used in the Commission's cost analysis (table D.18). Excluding same-day procedures (lens procedures and renal dialysis), ALOS was on average 16 per cent higher for DVA patients.

Another concern expressed by study participants was that the DVA data are for payments based on prices negotiated between DVA and the providers of hospital services, rather than the cost of providing those services. The extent to which there is a mark up over costs could vary across jurisdictions for public hospitals and between different operators of private hospitals.

The Commission understands that there are notable differences between jurisdictions in how contracts are structured between DVA and public hospitals. For example, in some jurisdictions the cost of prostheses is included in a 'bundled charge'. Other jurisdictions charge for prostheses separately via the hospitals, in an arrangement similar to that between DVA and private hospitals. The cost of prostheses is included in the analysis below to ensure comparability between hospitals.

It is also important to note that DVA contracts with private hospitals do not cover payments to medical specialists, non-salaried allied health, diagnostic, radiology, and pathology services. These payments are settled separately by DVA with the specialists, and recorded in the data as a separate medical payment.

Table D.18 **Comparison of average length of stay for DVA and NHCDC patients, selected DRGs, 2006-07[a]**

		DVA population[b]		*NHCDC sample*	
DRG	*Description[c]*	*Public hospitals*	*Private hospitals*	*Public hospitals*	*Private hospitals*
I04Z	Knee Replacement and Reattachment	8.6	8.3	7.1	7.4
A06Z	Tracheostomy or Ventilation >95 hours	26.9	33.7	29.4	31.9
F12Z	Cardiac Pacemaker Implantation	6.2	4.9	4.6	4.1
F15Z	Percutaneous Coronary Intervention W/O AMI W Stent Implantation	4.0	3.3	2.3	2.2
E65A	Chronic Obstructive Airways Disease W Catastrophic or Severe CC	8.5	11.8	7.4	11.1
I03C	Hip Replacement W/O Catastrophic or Severe CC	8.4	8.4	6.8	7.2
I03B	Hip Replacement W Cat or Sev CC or Hip Revision W/O Cat or Sev CC	13.8	12.9	12.1	10.7
F62B	Heart Failure and Shock W/O Catastrophic CC	6.0	8.5	4.8	7.5
I08A	Other Hip and Femur Procedures W Catastrophic or Severe CC	14.0	18.1	14.7	16.5
E62A	Respiratory Infections/Inflammations W Catastrophic CC	10.5	14.4	10.0	12.8
F42B	Circulatory Disorders W/O AMI W Invasive Cardiac Inves Proc W/O C	2.5	1.9	1.9	1.5
B63Z	Dementia and Other Chronic Disturbances of Cerebral Function	17.1	14.4	12.3	15.0
E62B	Respiratory Infections/Inflammations W Severe or Moderate CC	6.6	9.4	5.8	8.1
F62A	Heart Failure and Shock W Catastrophic CC	11.6	15.5	10.5	14.5
E65B	Chronic Obstructive Airways Disease W/O Catastrophic or Severe CC	4.7	8.2	4.5	7.2
B70A	Stroke W Catastrophic CC	16.5	21.3	16.5	19.2
G02A	Major Small and Large Bowel Procedures W Catastrophic CC	17.4	18.4	17.1	16.7
F08B	Major Reconstruct Vascular Procedures W/O CPB Pump W/O Catastrophe	8.3	8.3	7.3	7.4

[a] DRGS are ranked by total cost across sectors by the Department of Veterans' Affairs for the four-year period 2003-04 to 2006-07. Renal dialysis (L61Z) and sameday lens procedures (C16B) are excluded from this table as they have an average length of stay (ALOS) of one day by definition. ALOS for the DVA population is for 2006-07. The NHCDC sample data is for 2007-08, and includes both public and private patients. [b] ALOS for the DVA population is the total number of occupied bed days divided by the number of separations for each selected DRG. [c] w: with. w/o: without. cc: complications and comorbidities. cs: catastrophic or severe. AMI: acute myocardial infarction. CPB: cardiopulmonary bypass. inves: investigation.

Source: Department of Health and Ageing (unpublished data); Department of Veterans' Affairs (unpublished data).

DVA patients in public hospitals are admitted as private patients and so are entitled to choose their doctor. As a result, medical costs for DVA patients in public hospitals are a combination of items billed by hospitals (services provided by salaried medical officers) and items billed separately by private medical specialists.[16] Prostheses are generally paid for separately in public hospitals by DVA. To ensure comparability between public and private hospitals, medical items billed by both hospitals and specialists are included in the analysis below.[17]

Among the 20 DRGs for which DVA provided data to the Commission, 70 per cent (14 DRGs) had a lower cost per separation in public hospitals in 2006-07 (table D.19). However, the difference in cost between the public and private sectors was relatively small on average across the 20 DRGs (cost per separation in public hospitals about 4 per cent lower than private hospitals).

Nevertheless, many of the DRGs had a cost difference that was relatively large. Around two-thirds of DRGs had a cost per separation in public hospitals that was more than 10 per cent lower or higher than in private hospitals. At the extremes:

- cost per separation in public hospitals for percutaneous coronary intervention without acute myocardial infarction, with stent implantation (F15Z), was 42 per cent ($8449) lower than in private hospitals
- cost per separation in public hospitals for dementia and other chronic disturbances of cerebral function (B63Z) was 50 per cent greater ($3943) than in private hospitals.

Cardiac procedures involving large prostheses costs — in particular, stenting and cardiac pacemaker implantation (F12Z and F15Z) — had a cost per separation that was more than 10 per cent lower in public hospitals, compared to private hospitals. This is broadly consistent with the Commission's DRG-level cost estimates. Public hospitals also had a lower cost for treating heart failure and shock with and without catastrophic complications or comorbidities (F62A and F62B).

[16] Costs for non-salaried medical officers are standard across both sectors, according to a fee set by DVA.

[17] For DVA patients in public hospitals, medical and prostheses costs were identified by DVA as costs incurred between the date of admission and date of separation. This may overstate the costs associated with a hospital episode of care, if the patient incurred health costs outside a hospital on the admission or separation date. The impact of this is considered to be negligible. DVA further advised that, particularly for public hospitals, there are a range of cost components that are not readily attributable to DRGs and so may be excluded from the cost estimates (DVA, pers. comm. 20 November 2009.

Table D.19 **Separations and episode costs for DVA patients, selected DRGs, 2006-07[a]**

		Separations		*Cost per separation*	
DRG	*Description*[b]	*Public*	*Private*	*Public*[c]	*Private*[d]
		no.	no.	$	$
I04Z	Knee replacement and reattachment	101	2 147	21 375	21 518
A06Z	Tracheostomy or ventilation >95 hours	235	197	80 069	82 370
F12Z	Cardiac pacemaker implantation	244	1 368	18 476	21 292
C16B	Lens procedures, sameday	831	7 881	3 436	3 387
F15Z	Percutaneous coronary intervention w/o AMI w stent implantation	97	1 335	11 512	19 961
E65A	Chronic obstructive airways disease w cs cc	2 180	1 608	6 734	8 008
I03C	Hip replacement w/o cs cc	231	935	19 428	22 446
I03B	Hip replacement w cs cc or hip revision w/o cs cc	405	634	23 229	24 680
F62B	Heart failure and shock w/o catastrophic cc	2 470	2 065	4 726	6 047
I08A	Other hip and femur procedures w cs cc	661	354	19 008	19 065
E62A	Respiratory infections/inflammations w catastrophic cc	1 278	706	9 436	10 032
F42B	Circulatory disorders w/o AMI w invasive cardiac inves proc w/o cc	259	2 898	5 049	5 693
L61Z	Admit for renal dialysis	22 437	12 744	516	399
B63Z	Dementia and other chronic disturbances of cerebral function	1 050	583	11 264	7 526
E62B	Respiratory infections/inflammations w severe or moderate cc	1 494	1 187	5 425	6 612
F62A	Heart failure and shock w catastrophic cc	906	624	9 662	10 921
E65B	Chronic obstructive airways disease w/o cs cc	1 771	1 489	3 892	5 509
B70A	Stroke w catastrophic cc	763	272	14 694	12 960
G02A	Major small and large bowel procedures w catastrophic cc	226	356	27 608	23 665
F08B	Major reconstructive vascular procedures w/o CPB pump w/o catastrophic cc	107	551	20 312	18 614

[a] Top 20 DRGs ordered in terms of total cost incurred by DVA over the four-year period 2003-04 to 2006-07. Activity in standalone day procedure centres was excluded. DVA advised that, particularly for public hospitals, there are a range of cost components that are not readily attributable to DRGs and so may be excluded from the cost estimates. [b] w: with. w/o: without. cc: complications and comorbidities. cs: catastrophic or severe. AMI: acute myocardial infarction. CPB: cardiopulmonary bypass. inves: investigation. [c] Public costs include data supplied by DVA as hospital, medical and prostheses costs. Costs of public hospital episodes are indicative because they include South Australian costing rates that have yet to be finalised. [d] Private costs include data supplied by DVA as hospital medical, prostheses, theatre, accommodation, bundled and other costs. Medical costs include diagnostics costs and allied health costs. Pharmacy and Intensive Care Unit costs are not included.

Source: Department of Veterans’ Affairs (unpublished data); Productivity Commission estimates.

The DVA cost data provide a useful point of comparison with the Commission's DRG-level cost estimates, although such a comparison needs to be viewed in light of the abovementioned qualifications. To enable such comparisons, the Commission's 2007-08 estimates were deflated to 2006-07 values using the total Health Price Index (AIHW 2009c). It was found that:

- The cost per separation for DVA patients in public hospitals is within 90 to 110 per cent of the Commission's estimate for six out of the 20 DRGs. The cost for DVA patients was more than 10 per cent below the Commission's estimate for seven DRGs, and more than 10 per cent above for the remaining seven DRGs.
- The cost per separation for DVA patients in private hospitals appears to be more comparable to the Commission's estimates. The cost for DVA patients in private hospitals was within 90 to 110 per cent of the Commission's estimate for ten out of the 20 DRGs. The cost for DVA patients was more than 10 per cent below the Commission's estimate for three DRGs, and more than 10 per cent above for the remaining seven DRGs.

E Multivariate analysis in detail

The purpose of this appendix is to detail the data and statistical techniques the Commission has used its multivariate analysis of the performance of public and private hospitals. A summary of previous selected studies is presented in section E.1. A description of the methods applied is given in section E.2. Data sources and the Commission's approach to assembling the dataset are outlined in section E.3. The variables used in the analysis are described in section E.4. Results of the analysis and post-estimation statistics are presented in section E.5. The Commission's proposed future analysis is discussed in section E.6.

E.1 Previous studies

There are a large number of multivariate studies of hospital performance that have been undertaken worldwide. Despite this large number, only a few have used Australian data. O'Neill et al. (2008), for example, in a detailed study of 79 data envelopment analysis (DEA) studies did not include any Australian studies in their review. A similar pattern can be gleaned from literature reviews by Butler (1995), Peacock et al. (2001), Hollingsworth (2008) and Hollingsworth and Peacock (2008).

This is not to say that there have not been any Australian studies. The Commission reviewed thirteen of the more commonly cited Australian studies published since the mid-1990s. These include Butler (1995), SCRCSSP (1997), Webster, Kennedy and Johnson (1998), Yong and Harris (1999), Wang and Mahmood (2000a, 2000b), Paul (2002), Queensland Department of Health (2004), Mangano (2006), Jensen, Webster and Witt (2007), Gabbitas and Jeffs (2008), and Chua, Palangkaraya and Yong (2008, 2009).

A summary of the methods and data used in the overseas and Australian studies is given in table E.1. The table is organised according to the type of function (cost or production) and modelling techniques used (DEA, stochastic frontier analysis (SFA), stochastic distance function (SDF) or other). Studies that employed more than one modelling technique (such as Webster, Kennedy and Johnson 1998) are therefore reported more than once.

Table E.1 **Selected literature review**

Author(s) and year published	*No. of hospitals and year(s)*	*Dependent variable*	*Independent variables*	*External factors*	*Quality or patient safety*
Cost function – Stochastic frontier analysis					
Herr (2008)	1594 German public, non-profit private, and for-profit private hospitals, 2001-2003.	Total (adjusted) costs.	No. of cases, no. of weighted cases, unit prices for doctors, nurses, other staff, no. of beds, surgery ratio, total adjusted costs per bed, total adjusted costs per weighted case.	No subsidies dummy, East dummy, female ratio, 75+ ratio.	Occupancy rate, nurse-bed ratio, average length of stay (ALOS), mortality rate.
Yaisarwang and Burgess (2006)	131 US Vets Affairs hospitals, 2000.	Total (adjusted) costs.	Medical, nursing and other salaries, no. of operating beds, outpatient services, inpatient services, access indicators (occupancy rate, waiting days, market penetration).	Intensive care unit intensity index, urban, teaching and psychiatric hospital status.	In-hospital mortality rate, readmission rate, length of stay for readmissions, average days to readmit.
Jacobs (2001)	232 National Health Service hospitals, 1995-96.	Cost Index (actual cost divided by expected cost).	Emergency room (ER) visits, casemix weight, index of unexpected ER visits, occasions of outpatient services.	Transfers to and from a hospital, patients under 15, patients over 60, female patients, teaching, market forces factor.	None.
Wang and Mahmood (2000a)	113 NSW public hospitals (in two peer groups – large and small) 1997-98.	Total variable cost.	Inpatient casemix index, occasions of service, ER visits, input price of medical staff, average non-medical costs, average available beds, percentage sameday separations.	Dor and Farley index, inpatient casemix index.	ALOS of acute separations.
Yong and Harris (1999)	35 large Victorian acute public hospitals for 1994-95.	Total operating expend., admitted patient cost.	Weighted-inlier equivalent separations (WIES), occasions of service, emergency services, average medical wage, nursing wage, other staff wage, hotelling wage, medical support staff wage, size (number of beds).	Metropolitan hospital, teaching status.	Occupancy rate, staff per WIES.
Rosko and Chilingerian (1999)	195 Pennsylvania acute care hospitals, 1989.	Total costs.	Inpatient separations, outpatient visits, wage rate, average price of capital, casemix index.	Severity of illness index, teaching variables, Herfindahl index.	None.
Linna (1998)	Finnish hospitals from 1988 to 1994.	Net operating cost.	Inpatient admissions, accident and emergency visits, hourly wage index, index on local government expenditure, time dummy.	Research and development variable, teaching dummy.	Readmission rate.
Webster, Kennedy, Johnson (1998)	280 Australian private hospitals in 1994-95.	Total operating expenditure.	Bed unit costs, materials unit costs, staff unit costs, revenue (output), occupied bed days, squared and cross terms.	None.	None.

(Continued next page)

Table E.1 (continued)

Author(s) and year published	*No. of hospitals and year(s)*	*Dependent variable*	*Independent variables*	*External factors*	*Quality or patient safety*
Zuckerman, Hadley and Iezzoni (1994)	1600 US hospitals in 1984 and 1985.	Total operating cost.	Medicare admissions, Medicare post admission days, non-Medicare admissions and non-Medicare post-admission days, outpatient visits, average salary per FTE (full-time equivalent), average capital cost per bed.	Percent male patients, percent older patients, scores for disease status, plus a large number of factors descr bing characteristics of hospitals.	Transfers from another hospital, mortality rates of certain patients.
Vitiliano and Toren (1994)	443 US nursing homes for 1987 and 1990.	Total costs.	Patient days, admissions and transfers, per cent low care patients, wages of medical aids, registered nurse wages, property expenses (per square feet).	Voluntary, public, corporate, proprietorship, partnership.	None.
Cost function – Ordinary least squares					
Dor and Farley (1996)	500 US acute non-federal general hospitals.	Total variable (operating) cost.	Inpatient discharges, casemix index, outpatient services, surgery share, ER visits, average salary, average capital price.	Severity of illness index, source of hospital funding.	None.
Butler (1995)	121 Queensland public hospitals and 35 private hospitals.	Average cost per casemix-adjusted separation.	ALOS, occupancy rate, case flow rate, no. of beds.	None.	None.
Scott and Parkin (1995)	76 Scottish acute hospitals for 1992-93.	Total variable cost.	No. of acute discharges, no. of other discharges, acute length of stay (LOS), other LOS, outpatient and ER visits, beds.	None.	None.
Granneman, Brown and Pauly (1986)	867 US hospitals in 1982.	Total annual cost.	No. of acute inpatient, sub-acute, and intensive care days and discharges, and accident and emergency visits, outpatient and other visits, wage rates for four categories.	Revenue sources, location dummies, per capita income of region, teaching status and presence of particular facilities.	None.
Single output production function – Stochastic frontier analysis					
Herr (2008)	1594 German public, non-profit private, and for-profit private hospitals, 2001–2003.	No. of cases, no. of weighted cases.	No. of doctors, no. of nurses, no. of other staff, no. of beds, total adjusted costs per bed, total adjusted costs per weighted case.	No subsidies dummy, East dummy, female ratio, 75+ ratio, surgery ratio.	Occupancy rate, nurse-bed ratio, ALOS, morality rate.

(Continued next page)

Table E.1 (continued)

Author(s) and year published	*No. of hospitals and year(s)*	*Dependent variable*	*Independent variables*	*External factors*	*Quality or patient safety*
Mangano (2006)	116 Victorian public hospitals, 1992-93 to 1995-96.	Total WIE separations, total inpatients treated.	No. of FTE nurses, no. of FTE medical support staff, no. of admin and clerical staff and no. of FTE hotelling staff, average no. of available beds.	Teaching and metropolitan location status.	None.
Brown (2003)	20 per cent sample of hospitals in 17 US states, 1992 to 1996.	Inpatient separations.	No. of FTE employees, no. of beds, capital expenses, casemix index.	Share of admissions enrolled in health management organisations, share enrolled in preferred provider organisations, teaching dummy, public & for-profit status.	None.
Webster, Kennedy, Johnson (1998)	300 private hospitals for 1994-95.	Revenue, composite of occupied bed days.	No. of FTE staff, no. of beds, cost of materials, (plus squared and cross terms).	Hi tech dummies.	None.
Multi-output production function – Data envelopment analysis					
Chua, Palangkaraya and Yong (2009)	123 Victorian public hospitals between 2003-04 and 2004-05.	Total WIES	No. of FTE doctors, no. of FTE registered and other nurses, no. of FTE admin, domestic and other staff, no. of beds, expenditures on drug, medical and surgical supplies.	Second-stage Tobit regression testing for the effects of hospital competition.	Risk-adjusted unplanned readmissions (output).
Vitikainen, Street and Linna (2009)	40 Finnish public acute hospitals in 2005.	Casemix-adjusted inpatient admissions (episodes, days and cases), outpatient visits and ER visits	Hospital operating costs.	None.	None.
Nayar and Ozcan (2008)	53 non-federal hospitals in Virginia in 2003.	Casemix-adjust. separations, outpatient visits (including accident and emergency).	No. of total staff, no. of beds, costs (excluding payroll and costs), total assets.	Teaching FTEs (as an output).	Percent of patients receiving: antibiotics; oxygenation; and aged 65+ given pneumoccal vaccination.
Mangano (2006)	100 Victorian public hospitals, 1992-93 to 1995-96.	WIES, total inpatients treated.	No. of FTE non-medical staff, average no. of available beds.	None.	None.

(Continued next page)

Table E.1 (continued)

Author(s) and year published	*No. of hospitals and year(s)*	*Dependent variable*	*Independent variables*	*External factors*	*Quality or patient safety*
Harrison and Sexton (2006)	Between 471 and 480 private, public, not-for-profit for 1998 and for 2001.	Admissions, outpatient visits.	No. of FTE staff, no. of beds, operating expenses, no. of services.	None.	None.
Queensland Department of Health (2004)	Queensland public hospitals for 2000-01 to 2002-03.	Weighted separations, outpatient occasions of service, other admitted care .	No. of FTE staff, non-labour costs and gross asset values	None.	None.
Biørn et al (2003)	Unspecified no. of Norwegian hospitals between 1992 and 2000.	Casemix-adjusted separations, fee-weighted outpatient visits .	No. of FTE physicians, no. of other FTE staff, medical costs, total expenses.	Dummies for funding source and university affiliation and location.	None.
Hofmarcher, Paterson, and Riedel (2002)	93 Austrian hospitals between 1994 and 1996.	Patient days, no. of discharges, LDF points.	No. of medical staff, no. of para-medical staff, no. of admin. staff, no. of beds, no. of wards, Index of casemix complexity.	None.	None.
Al Shammari (1999)	15 Jordanian hospitals, 1991–1993.	Patient days, minor operations, major operations.	No. of physicians, no. of health personnel, no. of bed days.	None.	None.
Wang and Mahmood (2000b)	113 NSW public hospitals for 1997.	Inpatient casemix index, inpatient admissions, outpatient visits, ER visits.	No. of doctors, no. of nurses, no. of non-medical staff, no. of beds, other expenses.	None.	ALOS of acute separations.
Webster, Kennedy, Johnson (1998)	301 private hospitals for 1994-95.	Inpatient days, surg. days, non-patient services, nursing home days, surg. proc., inpatient separations, ER visits, comp. output.	No. of FTE medical staff, contract value of visiting medical officers, no. of FTE nurses, no. of FTE other staff, no. of beds, cost of materials.	None.	None.
Burgess and Wilson (1998)	2420 US hospitals with 100+ beds, 1985 to 1988.	Acute inpatient days, casemix-adjusted discharges, long-term care days, no. of outpatient visits, ambulatory surgeries, inpatient surgeries.	No. of registered nurses, no. of practice nurses, no. of other clinical staff, no. of non-clinical staff, no. of acute beds, no. of long-term beds, casemix index.	None.	None.
O'Neill (1998)	40 Philadelphia and Pittsburgh hospitals (27 urban and 13 teaching) with 300+ beds in 1992.	Casemix-adjust. inpatient medical separations, casemix-adjust. inpatient surgical separations, casemix-adjust. outpatients, no. of trained residents.	No. of FTE staff, no. of beds, operational expenditure (excluding payroll and capital).	Capital intensity index for specialist units.	None.
SCRCSSP (1997)	109 Victorian public hospitals for 1994-95.	Three categories of WIES outputs.	No. of FTE non-medical staff, no. of FTE medical staff, all FTE staff, non-salary costs, medical salaries, total salaries.	None.	Unplanned readmission rates.

(Continued next page)

Table E.1 (continued)

Author(s) and year published	*No. of hospitals and year(s)*	*Dependent variable*	*Independent variables*	*External factors*	*Quality or patient safety*
Ferrier and Valdmanis (1996)	360 US rural hospitals for 1989.	No. of acute days, subacute days, no. of intensive days, no. of surgeries, discharges, outpatients	No. of FTE staff, no. of beds, size, regional location, ownership.	None.	Occupancy rate.
Bedard and Wen (1990)	58 New York and West Pennsylvania hospitals 1974 to 1979.	No. of inpatient separations, no. of surgical operations, no. of outpatient visits.	No. of FTE staff, no. of beds; cost of labour, non-payroll expenditure.	None.	None.
Morey and Dittman (1996)	105 North Carolina hospitals in 1978.	No. of patient days for persons aged under 14, patient days for persons aged 14 to 65, patient days for persons aged over 65.	Cost of nursing services, cost of ancillary services (for example, radiology), cost of administration and general services.	No. of intensive-care beds, acute beds and other beds, percent each of intensive-care patient days, intensive or acute-care patient days, capital value of hospital.	None.
Borden (1988)	52 New Jersey hospitals 1979 to 1984.	No. of cases treated for high most common diagnosis-related groups (DRGs), all other DRG separations combined.	No. of total FTE staff, no. of FTE nurses, no. of beds, other non-payroll expenses.	None.	None.
Multi-output production function with some outputs defined as undesirable – Data envelopment analysis					
Clement et al. (2008)	667 hospitals from 10 US states for 2000.	No. of births, outpatient surgeries, ER visits, outpatient visits, casemix-adjusted admissions.	No. of FTE registered nurses, no. of FTE practice nurses, no. of other FTE staff, no. of beds, and capital.	None.	Risk-adjusted acute myocardial infraction, congestive heart failure, stroke, gastrointestinal haemorrhage, pneumonia.
Multi-output production function – Stochastic distance function					
Ferrari (2006)	52 Scottish public hospitals for 1991-92 to 1996-97.	Inpatients index, outpatients et al. services index.	No. of medical staff, no. of nursing staff, no. of other staff, no. of beds, capital.	None.	None.

(Continued next page)

Table E.1 (continued)

Author(s) and year published	*No. of hospitals and year(s)*	*Dependent variable*	*Independent variables*	*External factors*	*Quality or patient safety*
Siciliani (2006)	17 Italian hospitals between 1996 and 1999.	No. of discharges, surgical discharges, medical discharges.	No. of physicians and nurses, no. of other personnel, no. of beds.	None.	None.
Paul (2002)	223 NSW public hospitals in 1995-96.	No. acute inpatient seps, non- and sub-acute bed-days, OOS, Inpatient seps separated into public and private, and were unweighted.	No. of FTE staff, no. of beds, capital, cost of materials, no. of services, no. of diagnoses.	Research, rurality, index of education and occupation, teaching.	Standardised mortality ratio.
Löthgren (2000)	26 Swedish county hospitals 1989–1994.	No. of operations, no. of physician visits, no. of inpatient admissions.	Cost expenditure, no. of beds.	None.	None
Gerdtham, Löthgren, Tambour and Rehnberg (1999)	26 Swedish county hospitals 1989–1995.	No. of operations, no. of physician visits, no. of inpatient admissions.	Cost expenditure, no. of beds.	Reimbursement mechanism, university hospital status, patient age.	None
Grosskopf, Margaritis and Valdmanis (1995)	108 Not-for-profit and public hospitals in California and New York in 1982.	No. of acute patient days, no. of intensive care inpatient days, no. of inpatient and outpatient surgeries, no. of ER visits.	No. of physicians, no. of FTE non-medical staff, net plant assets.	None	None
Malmquist productivity change (including when some outputs are undesirable)					
Weng et al. (2009)	65 Iowa hospitals between 2001 and 2005.	Average speeds of: treatment per case, swing bed service, no. of admitted patients, no. of swing bed patients.	No. of staff members, no. of available beds.	None.	None.
Arocena and Garcia-Prado (2007)	20 Costa Rican public hospitals between 1997–2001.	No. of casemix-adjusted discharges, no. of casemix-adjust. outpatient services.	No. of FTE physicians, no. of FTE nurses, no. of beds, expenditure on goods and services.	None.	No. of casemix-adjusted hospital readmissions.
Chen (2006)	40 Taiwanese public and private hospitals.	No. of seps, no. of surgeries, no. of intensive cares, no. outpatient visits.	No. of doctors, no. of nurses, no. of beds, cost of other medical supplies, no. of doctors and nurses per department.	Second stage regression of public status, severity of illness, Herfindahl index.	ALOS and occupancy rate in a second-stage regression
Sola and Prior (2001); Prior (2006)	8 private and 12 public hospitals for 1990–1993.	No. of acute days, no. of long stay days, intensive days, no. of visits.	No. of FTE health staff, no. of FTE other staff, no. of beds, cost of materials.	None	No. of infections.
Maniadakis and Thanassoulis (2000)	75 Scottish hospitals for 1991-92 to 1995-96.	No. of ER patients, no. of inpatients, no. of day cases, no. of outpatients.	No. of doctors, no. of nurses, no. of other staff, no. of beds, cubic metre floor space.	None	None

(Continued next page)

Table E.1 (continued)

Author(s) and year published	*No. of hospitals and year(s)*	*Dependent variable*	*Independent variables*	*External factors*	*Quality or patient safety*
Webster, Kennedy, Johnson (1998)	280 private hospitals for 1991-92 to 1994-95.	No. of occupied bed days.	No. of FTE staff, no. of beds, cost of materials.	None	None
Linna (1998)	Finnish hospitals from 1988 to 1994.	No. of inpatient admissions, no. of AandE visits.	Hourly wage index, index on local government expenditure, time.	RandD variable, teaching dummy.	Readmission rate
Färe, Grosskopf, Lindgren and Poullier (1997)	19 OECD countries from 1974 to 1989.	No. of bed days, no. of discharges.	No. of physicians, no. of beds; No. of physicians per person, beds per person.	None.	Life expectancy for women over 40, reciprocal of infantry mortality rate.
Burgess and Wilson (1995)	1545 profit, non-profit, Vets Aff., and Local Govt hospitals for 1985–1988.	No. of inpatient days, no. of casemix separations, no. of long stay days, no. of outpatients, no. of ER surgeries, no. of inpatient surgeries.	No. of registered and practice nurses, no. of other clinical staff, no. of non-clinical staff No. of acute and long-term beds, value of capital, casemix severity.	None.	None.
Färe, Grosskopf and Valdmanis (1989)	39 Michigan hospitals with 200+ beds in 1982.	No. of acute care patients, no. of ICU patients, no. of emerg. patients, and no. of surgeries.	No. of doctors, no. of FTE non-doctor staff, no. of admissions, no. of beds.	None.	None.

	No. of hospitals and year(s)	*Dependent variables*	*Independent variables*
Patient-level modelling			
Chua, Palangkaraya and Yong (2008)	130 Victorian public hospital admitted patients with heart disease, 2000-01 to 2004-05.	Aggregate index of standardised hospital mortality rate	No. of episodes of care, proportion with: heart disease, admissions via emerg. department, old, with high Charlson score, and with private health insurance. Dummies for hospital location and status
Jensen, Webster and Witt (2007)	130 Victorian public hospitals admitted patients with heart disease, 1996 to 2005.	Readmission for AMI within 6 months, or death within 30 days of admission, mortality within 30 days of an unplanned 6-month readmission.	Charlson comorbidity index, gender, country of birth, Indigenous status, marriage status, SEIFA index, hospital status (private, public teaching, public non-teaching).
Dormont and Milcent (2004)	36 French public hospitals 1994–1997.	Average cost per stay, for acute myocardial infarction	Gender, age profile, length of stay, hospital admission, home admission, methods of treatment.

Some lessons from Australian and overseas studies

An examination of the Australian studies provides the following indicative conclusions:

- private hospitals are less costly than public hospitals (when medical costs are excluded)
- private hospitals give rise to better health outcomes than public hospitals
- for-profit private hospitals are more technically efficient than not-for-profit private hospitals
- metropolitan public acute hospitals are more technically and cost efficient than smaller rural hospitals.

A review of the overseas literature, however, generates some different impressions with respect to the comparison between public and private hospitals:

- public hospitals are generally more technically efficient than not-for-profit hospitals, which in turn are more efficient than for-profit hospitals (for example, Hollingsworth 2008)
- teaching hospitals are generally less efficient than non-teaching hospitals, possibly due to their more complex workloads (for example, Hollingsworth 2008)
- larger hospitals tend to be more efficient than smaller hospitals, possibly due to greater opportunities for scale economies (for example, Prior 2006; Vitikainen et al. 2009)
- urban hospitals tend to be more efficient than non-urban hospitals (for example, Färe, Grosskopf and Valdmanis 1989).

These, sometimes contradictory, impressions should not be generalised for public and private hospitals in Australia, and possibly overseas because of the:

- limited scope of the studies
- inadequate representation of hospital services
- inadequate representation of health outcomes, quality and patient safety
- method by which factors outside the control of hospitals are controlled
- country-specific dimensions that affect the way in which public and private hospitals are managed and the services they provide.

Even though the Commission is unable to draw firm conclusions about the studies' findings, lessons can be drawn about the methods employed in each of these studies.

Scope of studies

To date, no known Australian study has examined the comparative performance of public and private hospitals nationally. Of the studies reviewed by the Commission, most Australian studies examined the performance of public hospitals of one jurisdiction (commonly New South Wales or Victoria) (Chua, Palangkaraya and Yong 2008, 2009; Jensen, Webster and Witt 2007; Mangano 2006; Paul 2002; SCRCSSP 1997; Wang and Mahmood 2000a, 2000b; Yong and Harris 1999). Only three studies in the Commission's literature review examined the performance of both public and private hospitals, and these were limited to one jurisdiction (Butler 1995; Chua, Palangkaraya and Yong 2008, 2009). Only one study was conducted on a national scale, but was limited to private hospitals (Webster, Kennedy and Johnson 1998).

Inadequate representation of hospital services

A hospital's performance should, ideally, be judged in terms of the cost of providing incremental improvements to its patients' health outcomes (Melbourne Institute of Applied Economic and Social Research, sub. 16). However, this is a problem for hospital-level studies because health-outcome measures cannot be readily constructed.[1] Instead, hospital performance is typically modelled by separately accounting for the intermediate outputs of hospitals (such as inpatient services, emergency department visits, and outpatient services) and the measurable aspects of quality and patient safety.

While the majority of Australian studies have sought to adjust for the casemix differences of inpatient services, not all have included emergency department visits and outpatient services as intermediate outputs (for example, Chua, Palangkaraya and Yong 2009; Mangano 2006; SCRCSSP 1997; Webster, Kennedy and Johnson 1998). This is particularly important when comparing public and private hospitals, given that relatively more public hospitals operate emergency departments than private hospitals.

Health outcomes, quality and patient safety

While some studies have directly measured patient health outcomes (for example, Chua, Palangkaraya and Yong 2008; Jensen, Webster and Witt 2007), the majority of Australian studies either ignored or only gave a cursory treatment to patient

[1] This tends not to be an issue for patient-level studies (which make use of the incidence of mortality) and country-level studies (which make use of life expectancies and disability-adjusted life expectancies).

health outcomes, quality and patient safety. The same can be said for most of the overseas studies.

There appear to be two broad approaches to measuring quality and patient safety:

- Indirect (or proxy) variables are used to describe the level of patient care in a hospital. These include the average length of stay, the occupancy rate, and the ratio of clinical workforce per bed or patient (for example, Chen 2006; Ferrier and Valdmanis 1996; Herr 2008).
- Direct variables of quality and patient safety. The most commonly used measures are readmission rates and mortality rates (for example, Linna 1998; Nayar and Ozcan 2008; Yaisarwang and Burgess 2006).

Factors outside the control of hospitals

Finally, most Australian studies did not adequately account for factors outside the control of hospitals (for example, Queensland Department of Health 2004; Webster, Kennedy and Johnson 1998). Again, the same can be said for many overseas studies (for example, Färe, Grosskopf and Valdmanis 1995; Maniadakis and Thanassoulis 2000).

Where external factors have been taken into account, they have tended to include:

- patient characteristics, such as:
  - patient comorbidities (for example, Zuckerman, Hadley and Iezzoni 1994)
  - gender and age profile of patients (for example, Zuckerman, Hadley and Iezzoni 1994)
  - patient socioeconomic characteristics (for example, Jensen, Webster and Witt 2007; Paul 2002)
- financial incentives of hospitals, such as:
  - source of patient revenues — the extent to which a hospital is funded using a prospective payment system or operates under capped budgets (for example, Brown 2003; Dor and Farley 1996)
  - market power of the hospital (for example, Chua, Palangkaraya and Yong 2009; Rosko and Chilingerian 1999)
- geographic characteristics, such as:
  - hospital location (for example, Granneman, Brown and Pauly 1986; Herr 2008)

- hospital roles, functions and specialisation, such as:
  – whether it is a teaching or university hospital, the extent of research and development (for example, Linna 1998; Yong and Harris 1999)
  – the presence of specialist facilities or technologies (for example, O'Neill 1998; Yaisarwang and Burgess 2006)
  – the extent to which the hospital participates in inter-hospital transfers (for example, Jacobs 2001).

There is a risk that hospital efficiency estimates would be biased if any of these 'external' factors are ignored. Worthington (2004), for example, argued that ignoring patient characteristics could result in estimates of hospital efficiency representing differences in patient characteristics rather than the hospital's performance.

Ownership or financial incentives?

One striking difference between the Australian and overseas studies is the comparative efficiency of public and private hospitals. While it is conceivable that private hospitals are more (cost) efficient in Australia and less technically efficient overseas, it is possible that these findings reflect other confounding factors (Hollingsworth 2008). One such factor is the way in which public and private hospitals are funded.

There are three mechanisms by which publicly- and privately-owned hospitals are funded:

- prospective payment systems (PPS) — in which hospitals are paid a fixed price for each unit of output they provide
- per diem funding — where hospitals are paid for each patient in accordance with the number of days spent in hospital
- global budget caps — where hospital budgets are capped.

Publicly-owned hospitals have traditionally been funded under capped global budgets and privately-owned hospitals have been funded by private insurers on a per diem basis. PPS funding (or casemix funding as it is known in Australia) is increasingly being adopted to fund both public and private hospitals in Australia and overseas.

When hospitals are compared in terms of their funding mechanisms, a tentative conclusion is that PPS funding is at least as efficient as funding under capped budgets, and that both are more efficient than per diem funding. For example:

- US hospitals funded under the Medicare PPS were observed to have lower costs than those that did not (Rosko and Chilingerian 1999; Zuckerman et al. 1994)
- Norwegian hospitals that were funded by PPS were found to be more efficient than those that were funded by global budgets (Biørn et al. 2003)
- even though public hospitals in Germany were found to be more cost and technically efficient than private hospitals (Herr 2008), the author noted that this might be because public hospitals were funded under global budget caps and private hospitals were paid on a per diem basis
- there is some evidence that US hospitals that receive prospective payment funding are more technically efficient than those that are funded on a per diem basis (Bedard and Wen 1990; Morey and Dittman 1996), though Borden (1988) came to the opposite conclusion
- the introduction of PPS funding arrangements in Taiwan has led to improvements in productivity and quality, and improvements were strongest among public hospitals. PPS was observed to lead to excessive medical services among private hospitals (Chen 2006)
- Löthgren (2000) and Gerdtham et al. (1999) each found that Swedish hospitals funded with capped budgets were more efficient than those that were funded on an output basis, but the authors acknowledged that they did not distinguish between PPS and per diem funding arrangements.

A related confounding factor is that the generosity of the payer may also make a difference to the reported efficiency. For example, Dor and Farley (1994) found that US Medicare and private health insurance (PHI) pay relatively more than Medicaid (and residual purchasers) and as a consequence, experienced higher hospital costs. A third confounding factor is the role played by health management organisations, which Brown (2003) found to make private hospitals more efficient than not-for-profit private hospitals.

A key lesson for this study is to distinguish between ownership and funding models, to the extent that such data are available.

E.2 Commission’s approach to modelling hospital performance

Hospitals are complex in the services they provide. There is also considerable diversity between them in terms of the services they provide and their patients. Hospitals can be compared in terms of technical and cost efficiency.

The Commission’s analysis in this report focuses on understanding the factors that drive technical efficiency in the hospital sector. To achieve this, the first stage of analysis is based on a pooled dataset of all hospitals in the sample for a single year (2006-07). The pooled sample allows for variations in efficiency to be detected on the basis of hospital size, indicating the extent to which scale economies exist across the hospital sector. The pooled sample also allows for the number of observations in the dataset to be preserved, which improves the accuracy of the estimated model.

The Commission intends to undertake further analysis over coming months of hospital performance in terms of both hospital outputs and costs, using a longer dataset from 2003-04 to 2006-07. It is intended that the results from this analysis will be published in March 2010.

The following discussion provides an overview of the techniques the Commission has used for this first stage of its analysis.

Production function

In the first stage of analysis, hospital performance is modelled on the basis of an output-oriented production function, where a hospital’s output (volume and type of services provided) is assumed to depend on its use of inputs (resources such as staff and capital). In the context of an output-oriented production model, hospital performance is measured in terms of the hospital’s capacity to maximise its output for a given set of inputs. This is known as technical efficiency (Coelli et al. 2005).

The efficiency of an individual hospital can be assessed by comparing its actual output to the optimal level of output that could be achieved if the hospital adopted best-practice production techniques. Using the available data in the sample, a production ‘frontier’ is constructed which represents the optimal level of output achievable. In this method of benchmarking hospital performance, in general, production functions are widely used because they do not rely on any assumptions about the behaviour of hospitals in relation to inputs and output prices.

The production model is founded on the following form:

$$y_i = f(x_i) \tag{1}$$

where y_i is the output and x_i is the vector of inputs for hospital i. Following Kumbhakar and Lovell (2000), at this stage of analysis, the production model is expressed as a deterministic function. Random variation will be introduced at a later point.

When applied in a benchmarking framework, the optimal level of output that could be achieved by a best-practice hospital is represented by:

$$y^* = f(x) \tag{2}$$

where y^* is the output of the best-practice hospital, and x is the vector of inputs that generates the optimal level of output.

From these equations, the technical efficiency (TE) of a given hospital can be computed. The efficiency score for a given hospital reflects the extent to which its output falls below the optimal level of output achievable. Specifically, the scope of technical efficiency (TE) of hospital i is measured by the ratio of its actual output (y_i) to the optimal output achievable (y^*), as defined by:

$$TE_i = \frac{y_i}{y^*} \tag{3}$$

The value of TE_i will be between zero and one, where a value closer to one indicates that the hospital is closer to full technical efficiency.

Estimating the frontier

The assessment of hospital performance involves estimating the 'frontier' that benchmarks the optimal level of performance, and then computing the extent to which each hospital falls below this frontier. One of the most commonly applied methods to undertake these steps is stochastic frontier analysis (SFA). This econometric technique was originally developed by Aigner, Lovell and Schmidt (1977) and Meeusen and van den Broeck (1977) to study the efficiency and productivity of firms. A good introductory summary of SFA can be found in Coelli et al. (2005) and a more advanced treatment in Kumbhakar and Lovell (2000).

In SFA, the extent to which each hospital falls short of the benchmarked frontier (that is, the extent of its inefficiency) is captured by the error term of the regression. A key feature of SFA is that the error term is divided into two components:

- random error due to measurement errors, the omission of variables which cannot be measured, and other random factors that affect output
- an error term that captures the extent to which the individual hospital falls short of maximising its output for a given set of inputs (that is, its technical inefficiency).

When introducing the two error components into the production function, the stochastic frontier regression is modelled as:

$$y_i = f(x_i) + (v_i - u_i) \tag{4}$$

where y_i is output, x_i is a vector of inputs, v_i is the random error, and u_i is the measure of technical inefficiency), for hospital *i*. It is assumed that both v_i and u_i are independently and identically distributed; that v_i follows a normal distribution with a zero mean and constant variance; and that u_i is a non-negative value and follows a non-normal distribution that can be pre-defined as half-normal, truncated half-normal, exponential or gamma.

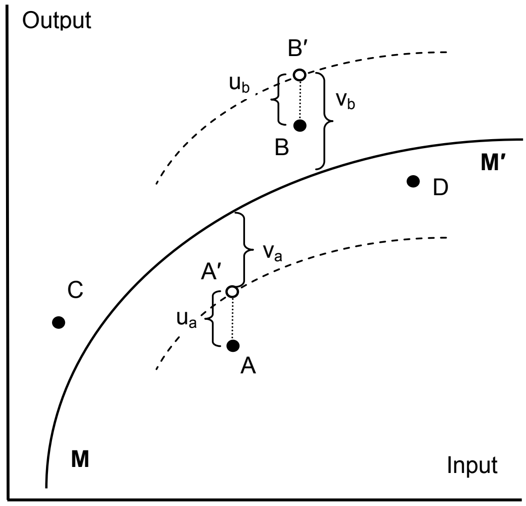
The error component u_i is interpreted to capture the technical inefficiency of each hospital. Although the choice of the distribution for u_i will affect the calculated efficiency scores, there is evidence to suggest that it has a relatively lesser effect on the ordinal rankings of the scores within a sample (Kumbhakar and Lovell 2000). Conventionally, the technical efficiency score of each hospital is expressed in logarithmic form such that the measured effects can be interpreted as proportional changes, as follows:

$$Index_i = \exp(-u_i) \tag{5}$$

Figure E.1 illustrates the estimation of the production model using SFA regression. The estimated function plots the relationship between input and outputs, shaped to reflect diminishing returns to scale. Firstly, the model is estimated to pass through the mean of the data (in this example, observation points *A*, *B, C* and *D*). This generates the deterministic component of the production function, *MM′*.

Next, the production function *MM′* is adjusted for each hospital by the component of the random error that cannot be attributed to technical inefficiency (v_i). This establishes each hospital’s stochastic frontier. In this example, the production function *MM′* is adjusted by the amounts v_a and v_b for hospitals *A* and *B* respectively, establishing their respective stochastic frontier points *A′* and *B′*. If v_i is positive, the stochastic frontier will shift above the deterministic production function (as for hospital *B*). If this random error is negative, the stochastic frontier will shift below it (as for hospital *A*).

Figure E.1 **Illustration of SFA production model**



Source: Adapted from Coelli et al. (2005).

Having established a stochastic frontier for each hospital that accounts for hospital-specific random error, the difference between each hospital's actual output and its frontier can be attributed to its technical inefficiency (as represented by the error component u_i). In this example, the technical inefficiency of hospitals *A* and *B* is represented by u_a and u_b respectively.

SFA offers some recognised advantages of over alternative estimation techniques. Compared to standard ordinary least squares (OLS) regression, SFA formally allows a role for random error in the estimation of efficiency measurements. OLS estimation would construct a production frontier through the mean of the data (as in the initial step of SFA) but would not adjust for hospital-specific random error when computing the distance between the frontier and actual output (as in the next step of SFA). As a further point of difference, SFA allows for a component of the errors to be skewed (that is, non-symmetrically-distributed) whereas OLS imposes the assumption that the whole error term is symmetrically distributed.

Another common technique applied in efficiency measurement is data envelopment analysis (DEA), which uses piece-wise linear programming to estimate the production function. A key difference between DEA and SFA is that SFA generates parameters on the basis of a functional form, whereas DEA generates estimates based on the values of the observations rather than an assumed functional form (Coelli et al. 2005).

The non-parametric approach of DEA may be considered an advantage because it means that fewer restrictions are imposed on the model, and there are less risks associated with misspecified functional forms (Nguyen and Coelli 2009). However, non-parametric estimation presents several drawbacks. First, the significance of the relationship between inputs and outputs cannot be statistically tested (PC 1999a; Siciliani 2006). Without testing their significance, explanatory variables may be inappropriately included in the frontier model. Second, non-parametric estimation is more sensitive to the presence of outliers, which may distort the construction of the production frontier and overstate the computed efficiency scores (Siciliani 2006). Third, non-parametric estimation does not formally allow for technical inefficiency to be distinguished from all other hospital-specific random error (Nguyen and Coelli 2009). For these reasons, the Commission has chosen to undertake SFA in favour over DEA.

Accounting for quality of care

While estimating the volume of output delivered as a function of inputs, the production model also needs to account for hospital resources that are allocated to the quality of care that a hospital delivers, and include appropriate measures of quality in the regression.

Before their inclusion, quality indicators need to be adjusted to control for differences in the risk characteristics of the patients admitted to different hospitals. In this context, risk refers to the extent to which patients' characteristics affect the likelihood of a successful treatment outcome, independent of the actions of the hospital. It may be expected that a hospital which admits relatively 'low-risk' patients will require fewer resources per separation, meaning that it can deliver a relatively larger volume of output for a given level of input. This will gives rise to higher efficiency scores, all other factors equal, compared to a hospital which admits relatively high-risk patients.

To adjust for patient characteristics, the Commission has used hospital-level variables that reflect the composition of each hospital's patient mix. For example, patients' gender is captured by a measurement of the proportion of a hospital's patients who are female.

Many of the available hospital-level quality indicators are measured as rates (for example, mortality rates and readmission rates). This means that the estimated regressors of the model must be specified to fall between pre-determined upper and lower bounds, as estimated by a Tobit model:

$$
\begin{aligned}
q_i{*} &= f(z_i) + \varepsilon_i \\
q_i &= q_i{*} \quad \text{if } q_L < q_i^* < q_U \\
&= q_L \quad \text{if } q_i^* \le q_L \\
&= q_U \quad \text{if } q_i^* \ge q_U
\end{aligned}
\tag{6}
$$

where q^* is the latent variable of the quality indicator, q_i is the observed value of the quality indicator, z_i are the patient characteristics assumed to influence q^*, q_L and q_U are the lower and upper bounds of the quality indicator, and ε_i is the error term, for hospital i. As with other censored regression models, parameters are estimated using maximum likelihood methods.

The estimated results of the Tobit regression are used to compute the standardised value of the quality indicator. This is computed by dividing the observed values by the estimated values. This is commonly applied to mortality rates, where a standardised value less than one indicates that a hospital is performing better than expected (the actual mortality rate is lower than predicted), while a value greater than one indicates an unfavourable performance (the actual mortality rate is higher than predicted) (Ben-Tovim et al. 2009). The standardised values of the quality indicator are included as regressors in the output equation.

Other factors influencing efficiency

The production function estimates a hospital's level of output as a direct function of its inputs. However, it is acknowledged that there are additional factors — known as covariates — that influence a hospital's production process and, therefore, its reported efficiency score. The appropriate method to incorporate such factors into the model depends on whether the factors are considered to be within the control of the hospital or not.

Factors which are considered to be *outside* of the hospital's control contribute to setting the position of the frontier. In this case, the covariates can be included in the production model, regressed directly against output. Factors which are considered to be *within* the hospital's control contribute to variations in efficiency below the benchmarking frontier. In this case, the covariates can be modelled as a function of the random errors of the output model.

The two steps of this regression are defined as:

$$\ln y_i = \beta_0 + \sum_{m=1}^{M} \beta_{mi} \ln x_{mi} + (v_i - u_i) \tag{7}$$

$$\mu_i^u = \delta_0 + \sum_{j=1}^{J} \delta_{ji} \ln z_{ji} + \xi_i \tag{8}$$

where y_{i}, x_i, v_i and u_i are as previously defined, μ_i^u is the conditional mean of u_i, z_i is the vector of additional factors, and ξ_{i} is the error term. Factors which are within the hospital's control are included in x_i, whereas factors which are outside of the hospital's control are included in z_i.

Model specification

Given that hospitals produce a range of outputs (rather than a single output), a stochastic frontier specification which allows for multiple outputs is used. Known as an (output) stochastic distance function, it is defined as:

$$D_{Oi}(x_i, y_i) = \min\{TE : y_i / TE \in P(x_i)\} \tag{9}$$

where y_i is the vector of outputs, x_i is the vector of inputs, and TE is the minimum amount by which output can be reduced and still remain producible with the given set of inputs (Kumbhakar and Lovell 2000).

When applied to the production model, several functional forms are applicable. One of the most basic and widely-applied functional forms is the Cobb-Douglas model, which regresses the terms in first-order form only. The functional form can be expanded with the inclusion of second-order quadratic and cross-terms that allow for interaction effects among the variables, as is applicable for a multi-output, multi-input production model (Paul 2002). The following equation specifies a production model in an expanded multi-input, multi-output form, known as a transcendental logarithmic (translog) distance function:

$$\begin{aligned} \ln D_{Oi}(x_i, y_i) = \alpha_0 &+ \sum_{m=1}^{M} \alpha_m \ln y_{mi} + \sum_{k=1}^{K} \beta_k \ln x_{ki} \\ &+ 0.5 \sum_{m=1}^{M} \sum_{n=1}^{M} \alpha_{mn} \ln y_{mi} \ln y_{ni} + 0.5 \sum_{k=1}^{K} \sum_{l=1}^{K} \beta_{kl} \ln x_{ki} \ln x_{li} \\ &+ \sum_{k=1}^{K} \sum_{m=1}^{M} \delta_{km} \ln x_{ki} \ln y_{mi} \end{aligned} \tag{10}$$

where D_{Oi} is the distance to the frontier (taking a value between 0 and 1), y_k represents output, x_m represents input, M is the number of outputs, and K is the number of inputs. As is common practice, all terms are specified in natural logarithms, so that the measures represent proportional values rather than absolute levels. The first line of equation (10), comprising first-order variables only, represents the standard Cobb-Douglas form. The inclusion of the higher-order squared terms in the second and third lines represents the complete translog function.

The Cobb-Douglas model is widely applied as it is more parsimonious and computationally simpler to estimate than the higher order, more flexible functional forms. Compared to the more flexible functional forms, the limited number of parameters in the Cobb-Douglas model means there is less risk of multicollinearity and less loss in degrees of freedom. Furthermore, the coefficients of the Cobb-Douglas model are relatively more straightforward to interpret as elasticity values.

However, the simplicity of the Cobb-Douglas model restricts its estimation power. For example, the introduction of the squared terms can be used to detect scale economies, while the further inclusion of cross-terms in the translog model can detect elasticity of substitution between inputs, production coefficients between inputs and outputs, and marginal rates of transformation between outputs (Nguyen and Coelli 2009; Siciliani 2006). All this means is that the Cobb-Douglas model is a relatively inflexible form and is not likely to completely fit the curvature of the production function.

In this analysis, the Commission estimated both the Cobb-Douglas and a restricted version of the translog model and then compared measures of their goodness-of-fit and predictive performance. Higher-order functional forms are expected to provide a more accurate fit of the observed data. These models, therefore, are expected to generate higher efficiency scores because they contain less unexplained variation that would otherwise be attributed to random error or inefficiency. Nguyen and Coelli (2009) presented a meta-analysis of hospital efficiency studies which substantiated this observation. When selecting the model to apply, it is also recognised that higher-order functional forms are likely to incur more computational difficulties, due to the large number of multiplicative parameters contained in the model.

For the models to comply with standard economic regularity properties, and for an empirical equation to be estimated, homogeneity constraints need to be imposed (Coelli et al. 2005; O'Donnell and Coelli 2005). The constraint of homogeneity of degree one in outputs is defined as:

$$\sum_{m=1}^{M}\alpha_m + \sum_{m=1}^{M}\sum_{n=1}^{M}\alpha_{mn}\ln y_n + \sum_{k=1}^{K}\sum_{m=1}^{M}\delta_{km}\ln x_k = 1 \tag{11}$$

This constraint is satisfied if:

$$\sum_{m=1}^{M}\alpha_M = 1, \quad \sum_{m=1}^{M}\alpha_{mn} = 1 \ \text{ for all } n, \quad \text{and } \sum_{k=1}^{K}\sum_{m=1}^{M}\delta_{km} = 0 \ \text{ for all } k. \tag{12}$$

According to Lovell et al. (1994), the homogeneity condition is equivalently satisfied by normalising equation (10) by one of the outputs (y_L), as follows:

$$\begin{aligned}\ln\left(\frac{D_i(x_i,y_i)}{y_{Li}}\right) &= \alpha_0 + \sum_{m=1}^{M-1}\alpha_m \ln\left(\frac{y_{mi}}{y_{Li}}\right) + \sum_{k=1}^{K}\beta_k \ln x_{ki} \\ &+ 0.5\sum_{m=1}^{M-1}\sum_{n=1}^{M-1}\alpha_{mn}\ln\left(\frac{y_{mi}}{y_{Li}}\right)\ln\left(\frac{y_{ni}}{y_{Li}}\right) + 0.5\sum_{k=1}^{K}\sum_{l=1}^{K}\beta_{kl}\ln x_{ki}\ln x_{li} \\ &+ \sum_{k=1}^{K}\sum_{m=1}^{M-1}\delta_{km}\ln x_{ki}\ln\left(\frac{y_{mi}}{y_{Li}}\right)\end{aligned} \tag{13}$$

This can be condensed to:

$$\ln\left(\frac{D_i}{y_{Li}}\right) = TL(x_i, \frac{y_i}{y_{Li}}, \alpha, \beta, \delta) \tag{14}$$

where $TL(.)$ refers to the translog function.

The expression can be re-arranged and specified as a stochastic distance function with the inclusion of the technical efficiency component and random error term, as follows:

$$\ln D_i - \ln y_L = TL(x_i, \frac{y_i}{y_{Li}}, \alpha, \beta, \delta) \tag{15}$$

$$-\ln y_L = TL(x_i, \frac{y_i}{y_{Li}}, \alpha, \beta, \delta) - \ln D_i \tag{16}$$

$$-\ln y_M = TL(x_i, \frac{y_i}{y_{Mi}}, \alpha, \beta, \delta) + (v_i - u_i) \tag{17}$$

where $-\ln D_i = (v_i - u_i)$ and v_i and u_i are as previously defined.

E.3 Data sources

Data for public and private hospitals, detailed at both patient and establishment levels, had to be sourced from several different data collections and then merged to create the final data set. Details of the data sources and the process of accessing and assembling the dataset are outlined below.

Public hospital data

Establishment-level data for public hospitals were drawn from the National Public Hospital Establishments Database (NPHED), which is held by the Australian Institute of Health and Welfare (AIHW).

Patient-level data for public hospitals were drawn from the National Hospital Morbidity Database (NHMD), which is also held by the AIHW.

Private hospital data

Establishment-level data for private hospitals were drawn from the Private Health Establishments Collection (PHEC), which is held by the Australian Bureau of Statistics (ABS). The collection is drawn from a census of private hospitals (acute and psychiatric) and free-standing day facilities (ABS 2008f).

Patient-level data for private hospitals were drawn from the National Hospital Morbidity Database (NHMD), which is held by the AIHW. Although the PHEC held by ABS contains patient data, the Commission does not regard these data to be useful for this study because they are not casemix-adjusted and do not include the details required on patient morbidity.

Accessing hospital data

To access data for the purpose of this analysis, the Commission obtained the consent of the state and territory health departments for the AIHW to release public hospital patient and establishment data to the ABS. The Commission also obtained the consent of 130 privately-owned hospitals for the state and territory health departments to provide additional information that would allow the private hospital patient data held by the AIHW to be matched with the establishment-level data held by the ABS. After excluding free-standing day facilities and non- and sub-acute facilities, there were 122 private acute hospitals in the sample.

The ABS undertook the analysis with the assistance of the Commission. This arrangement was to facilitate access to the private hospital information held by the ABS, and to safeguard the data drawn from both ABS and AIHW sources.

Assembling the data

The first step in assembling the dataset was to match the patient-level morbidity data needed with each hospital. The morbidity data were then aggregated to the establishment-level data. Hospital-level patient variables were created which represented the shares of patients with given patient-level characteristics.

In the case of private hospitals, the patient-level data contained in the NHMD (held by the AIHW) had to be matched with the corresponding establishment-level data contained in the PHEC (held by the ABS).

Furthermore, several adjustments to the dataset needed to be made to handle reporting inconsistencies.

- A number of Victorian hospitals are incorporated into regional networks. As a result, much of the establishment-level data for these hospitals are available at the network level and needed to be rescaled to match establishment-level data. Rescaling was achieved by disaggregating the networked data on the basis of the number of hospitals contained in the network, and weighting the values on the basis of each hospital's number of casemix-adjusted separations. To capture potential efficiency effects of belonging to a network and indicate networked hospitals, a dummy variable denoting network membership was created.
- A single observation was provided for Tasmanian public hospitals. The names and the number of beds are known for each Tasmanian hospital, but not the number of casemix-adjusted separations. The establishment- and patient-level data of the single Tasmanian observation were disaggregated on the basis of the number of acute and non-acute beds. On the basis of the hospital's name and address, the Australian Standard Geographic Classification – Remoteness Area (ASGC-RA) classification of each hospital was computed. The limitation of this approach is that it blurs the distinction between the functions of Tasmanian acute and non-acute hospitals.

- A single observation was provided for Tasmanian private hospitals. However, since the number of private hospitals in Tasmania was not known with certainty, the observation could not be disaggregated, although the scale of these hospitals is expected to be very small.

Representativeness of the sample

Ideally, the data contained in the sample for analysis should be representative of all Australian hospitals. In this study, however, data on private hospitals was only made available on a voluntary basis and therefore do not necessarily represent the full range of private hospitals in Australia.

In particular, a larger proportion of for-profit private hospitals made their data available to this study than not-for-profit private hospitals. For-profit hospitals accounted for 57 per cent of Australia's 289 private acute hospitals (AIHW 2009a). In contrast, 85 per cent of the private hospital sample comprises for-profit hospitals.

This presents two concerns. First, it means that the not-for-profit hospitals are relatively under-represented compared to for-profit hospitals. Second, it means that the dataset is potentially subject to sample-selection bias, as the private hospitals included in the study are not a random selection. If the factors which affect hospital efficiency also affect the likelihood that a hospital agreed to participate in the study, the efficiency estimates may be biased.

The Commission considered potential methods to overcome this sampling issue, including the Heckman correction procedure (Heckman 1976). However, given that there is no common statistical technique to address this issue in this field of analysis, and given the time constraints of this study, the Commission's analysis proceeded without such sampling correction. It is acknowledged, therefore, that the findings only apply to the hospitals included in the study, and the Commission cautions readers from drawing conclusions for all hospitals in Australia.

In its further analysis, the Commission intends to examine the degree to which the sample of hospitals included in the analysis adequately represents the population of hospitals Australia-wide, and further investigate methods to address potential sampling bias.

Final dataset

The AIHW provided a range of hospital-level data from the NHMD that correspond to 703 public hospital observations in its NPHED and 130 private hospital observations that agreed to participate in this study. After removing acute, sub-acute non-acute, psychiatric hospitals and free-standing day facilities, there were 508 acute hospital observations in the sample. Of these, 368 were public hospitals and another 18 that are ordinarily classified as public hospitals by the AIHW, but which are typically managed by non-government entities to provide public hospital services for state and territory governments. These are referred to as 'public contract' hospitals. There were also 122 private acute hospital observations in the sample (table E.2).

Table E.2 **Hospital sample by size, region and sector, 2006-07**[a]

	Major cities			*Outside major cities*			*All hospitals*
	Public	Private	Public contract	Public	Private	Public contract	
Very large	53	np	np	15	np	–	98
Large	21	16	np	16	6	np	70
Medium	14	26	–	31	12	–	83
Small & very small	8	np	–	210	np	np	257
All hospitals	**96**	**93**	**15**	**272**	**29**	**3**	**508**

a Hospital location is defined by the Australia Standard Geographical Classification (ABS 2001). Hospital size is defined by number of casemix-adjusted separations per year, where *very large* refers to 20 001 or more casemix-adjusted separations; *Large* is defined as 10 001 to 20 000 casemix-adjusted separations per year; *medium* is defined as 5001 to 10 000 casemix-adjusted separations per year; *small* is defined as 2001 to 5000 casemix-adjusted separations per year; and *very Small* is defined as 2000 or fewer casemix-adjusted separations per year. Sample refers to all the acute hospitals included in the Commission's multivariate analysis. **np** Not published due to confidentiality. – Nil or rounded to zero.

Source: Productivity Commission estimates based on unpublished ABS and AIHW data.

E.4 Variables

This section describes the variables selected for use in the analysis and discusses some associated sampling issues. Full details of the variables used in the analysis, including their definitions and summary statistics, are presented at the end of the section in table E.3.

Drawing on the literature review, variables used in the analysis are grouped as:

- outputs
- quality and patient safety
- inputs
- other factors that describe establishment characteristics, hospital roles and functions, financial incentives and patient characteristics.

Outputs

Ideally, a hospital's performance should be measured in terms of patient outcomes. Individuals seek hospital services in order to improve their physical and emotional wellbeing relative to what would otherwise be the case. However, it is not practicable to directly measure changes to patient health outcomes. Instead, the approach used here is to measure health outcomes along two dimensions — hospital outputs and quality of care.

Hospitals are complex entities that provide a wide range of services. This is a strong argument that hospitals should be modelled as multi-input multi-output firms (Butler 1995). Hospitals vary significantly in terms of the surgical and medical procedures they provide. Many provide some sort of outpatient services, emergency departments and a number provide teaching services while others maintain research and development programs.

Inpatient services

The Melbourne Institute of Applied Economic and Social Research suggested that a reasonable compromise would be to model inpatient activity at the major diagnostic category (MDC) level:

> … considering the need to keep model specification parsimonious in empirical analysis, this approach probably represents a reasonable compromise. (sub. 16, p. 4)

However, a concern is that since there are 23 MDCs, this would represent too many variables, particularly when more complex functional forms are considered. The categories of inpatient outputs used in this study are:

- acute separations — casemix-adjusted separations for MDCs 1 to 9, 11 to 13, 16 to 18, 21 and 22)
- pregnancy and neonate separations — casemix-adjusted separations for MDCs 14 and 15
- mental and alcohol separations — casemix-adjusted separations for MDCs 19 and 20
- other separations — casemix-adjusted separations for MDC 23
- endocrine, nutritional and metabolic diseases and disorders — casemix-adjusted separations for MDC 10. This was the dependent variable for the model.

Pregnancy and neonate MDCs were kept separate from the majority of acute care separations, as pregnancy and neonates do not generally constitute a disease or illness. Similarly, mental and alcohol separations were also kept separate because of concerns over the robustness of measuring cost weights for these categories.

Public hospital cost weights were used for both public and private hospitals. In the estimation, each of the output categories (except for the last) were normalised by the dependent variable (MDC 10). All variables were expressed in natural logarithms, and where a natural number was reported as zero, its corresponding natural logarithm was changed to zero.

Non-admitted occasions of service

There is no national casemix classification for outpatient services, so there is a greater need to provide a detailed level of aggregation of these hospital activities than it is for admitted patient care. The output categories are:

- accident and emergency services — the number of accident and emergency department presentations or visits
- allied health and other services — the number of occasions of service for allied health, dental and other outpatient services
- mental and alcohol services — the number of mental, alcohol and psychiatric outpatient services
- dialysis and endoscopy — the number of occasions of service for dialysis and endoscopy
- diagnostic services — the number of pathology and radiology services
- outreach services — the number of community services, district nursing and other outreach services.

Each of these output categories were divided by the reference category. Each output was expressed in terms of natural logarithms.

The Commission included a binary variable to indicate whether a hospital is a teaching hospital (‘1’ if it is teaching hospital, ‘0’ otherwise). However, no distinction was drawn between medical and nursing teaching functions, or the intensity of the teaching effort. The variable represents all forms of teaching functions — major and minor.

Given the procedure of normalising hospital outputs, the coefficients of the output variables on the right-hand side would be expected to take on a positive value. However, to make interpretation simpler, the dependent variable was multiplied by minus one to ensure that the right-hand side output variables take on a negative value. This assists in the interpretation of the coefficients — each of the output variables are expected to take a negative value (reflecting the marginal rate of transformation between the reference category and outputs) and a positive value for each of the inputs.

Quality and patient safety

A number of variables were available to the Commission to measure hospital quality, including:

- in-hospital mortality
- infection rates
- adverse events.

As noted in chapter 7, there are limits to both adverse events and hospital infections data due to under-reporting and the difficulty in attributing the role of hospital in contributing the cause of those events. As a result, these were not considered in this analysis of hospital performance, though they will be reconsidered in further work. Robust data on re-admissions were not available to the Commission.

Drawing on the practice of previous studies, in-hospital mortality rates were used as a measure of the quality of hospital services. Based on a review of literature into the standardisation of hospital mortality ratios (Ben-Tovim et al. 2009), the following variables were included:

- average comorbidity — the average Charlson Index of comorbidity
- distribution of comorbidity — the proportion of hospital separations that were associated with each of the seven indices of comorbidity (0, 1, 2, 3, 4, 5 and 6 or more) (Charlson et al. 1987)[2]
- age — the proportions of patients who are in youngest and oldest age groups
- gender — the proportion of patients who are female
- socioeconomic status — the proportion of patients who reside in areas of the highest quintiles of socioeconomic disadvantage, as measured by the Socio-economic index for Areas — Index of Relative Disadvantage and Advantage (ABS 2008g)

[2] The Commission explored the possibility of employing the Multipurpose Australian Comorbidity Scoring System (Preen et al. 2006) but chose not to use this approach because the data available to the Commission were neither linked between different hospitals or within the same hospital over time.

- remoteness of residence — the proportion of patients whose usual place of residence was in inner regional, outer regional, remote and very remote communities (as defined by the Australian standard Geographic Classification–Remoteness Area)
- Indigenous — the proportion of patients that identified themselves as Indigenous.

Unlike in other studies, no account was made for differences in the procedures undertaken by hospitals, as these are formally considered in the analysis of hospital production.

The Tobit regression generates the predicted mortality rates for each hospital. Using the estimates, risk-adjusted mortality ratios (RAMR) are derived. Lower ratios indicate lower relative mortalities after adjusting for patient differences. If a hospital faces a trade off between improving the quality of care and producing additional services, it is expected that the coefficient of the RAMR variable will be positive with respect to the output variables.

Inputs

Following common practice in this area of analysis, inputs into the production of hospital services include:

- nursing staff — number of nursing staff (measured in terms of full-time equivalents)
- diagnostic staff — number of diagnostic (pathology and radiology) staff (measured in terms of full-time equivalents)
- other staff — number of domestic, administration and other staff (measured in terms of full-time equivalents)
- medical and surgical supplies — expenditure on medical and surgical supplies used
- pharmaceutical supplies — expenditure on pharmaceuticals
- other inputs — expenditure on other hospital inputs, such as administration and clerical, housekeeping, and repairs and maintenance
- beds — number of beds of the hospital as a proxy for hospital capital. This is given by the number of beds licensed in a private hospital, and the number of beds published by the AIHW for public hospitals.

The total number of beds is not a satisfactory measure of the usage of capital in a hospital. The number of beds does not adequately reflect the change in capital stock over time or between hospitals. Ideally, capital measures should be disaggregated into the main categories of hospital activity — such as the number of ICU beds, non-acute beds, palliative care beds, the number of sameday chairs, the number of operating theatres, and so on. Instead, differences in the capital of hospitals were captured with variables that reflected differences in the roles and functions of hospitals (discussed below).

Since the number of doctors working in private hospitals is not known, the number of medical staff has been excluded from the analysis. All efficiency scores derived from the analysis are to be interpreted as the efficiency of the hospital, and not specifically of the hospital and the medical workforce.

Each of the coefficients of these variables, for a Cobb-Douglas specification, is expected to take a positive sign.

Patient-risk characteristics

Although it is posited above that differences in the level of patient risk might be represented in a measure of quality, it is feasible that patient-risk characteristics might directly influence the level of hospital output. For example, more morbid populations may compel hospitals to undertake additional services, to be more productive with the resources that they have. The patient-risk characteristics explored here include the same set described in the section quality and patient safety.

Hospital roles and functions

A number of other variables were included in the analysis to account for the differences between hospitals in terms of the services they provide, the resources they use and the patients they treat.

Admissions from an emergency department — the number of accident and emergency visits divided by the total number of inpatient separations is used as a proxy for the extent to which emergency patients are admitted hospitals. A number of commentators have said to the Commission that the presence of an accident and emergency department can reduce the throughput of inpatient services, particularly if there are insufficient beds available to accommodate the variability of demand. If this were the case, then the coefficient on this variable would be negative.

Same-day separations as a share of total separations — a number of study participants have said to the Commission that private hospitals would appear to be more technically efficient than public hospitals because the former undertake relatively more same-day separations. If same-day separations constitute best practice, and the variable were included in the main model (equation 7), the coefficient on the variable would be positive. If, on the other hand, same-day separations permit hospitals to reach best practice, the coefficient on the same-day separations variable would be positive in the second model (equation 8).

Proportion of patients treated with surgical and other procedures is a variable that describes the extent to which a hospital specialises in surgical and other DRG cases, or conversely, the degree to which public hospitals undertake medical DRG cases. Some participants to this study have argued that a difference between public and private hospitals is the ability of private hospitals to maximise their productivity by specialising in elective surgery procedures, which permits them to operate with higher levels of productivity. On the other hand, public hospitals are unable to refuse medical treatment, and since medical DRG cases have a greater likelihood of being unplanned, medical DRGs become inherently more difficult for public hospitals to manage. Ignoring the differences between surgical and medical cases has the potential to distort the interpretations of efficiency measures.

As noted earlier, the lack of detailed capital data limits the ability of this type of analysis to distinguish between hospitals on the basis of their inputs. Instead, a number of surrogate variables were used to test the extent to which there were such differences.

Hospital services can also differ in terms of the level of acuity in the services they provide. For example, hospitals that maintain level III intensive care units have different resourcing requirements to those than those that maintain residential aged care units and palliative care units. These three influences are represented with three binary variables (with ‘1’ indicating that these services or units are provided, ‘0’ if they are not).

Proportion of patients who are not treated as public patients is a proxy measure for the different levels of resources used by hospitals to treat public and non-public patients. It includes patients who are funded by private health insurance, Department of Veterans’ Affairs, third-party motor vehicle accident, workers’ compensation patients, and self-funding. Public hospitals are funded with capped budgets, at least when treating public patients. In contrast, the funding of non-public patients is uncapped. It is possible that differences between capped and uncapped funding enables hospitals to provide different service levels to public and non-public patients.

Evans and Walker indices

The Evans and Walker information indices are measures of the relative complexity of work undertaken by hospitals. They are based on work undertaken by Thiel (1967) in the field of information theory. Evans and Walker (1972) postulated a relationship between the complexity of work undertaken by a hospital and the information the hospital learns from undertaking that work. By establishing a link between complexity and information gain, the authors were able to adapt information indexes as proxies for hospital complexity.

In general, the amount of information a hospital learns from an admission is inversely related to the likelihood of that case occurring within the system and the likelihood of that hospital treating that particular case. If an event is almost certain to take place, such as a routine case from which the hospitals learns little, the hospital attracts a relatively low index of information gain (Butler 1988). In contrast, more complex (and presumably rarer cases) attract more information gain.

Evans and Walker offer two indices. They differ in terms of the assumptions about the prior knowledge of probabilities. The first assumes there is no prior knowledge of the distribution of cases among hospitals. This is a measure of the complexity of a hospital's caseload (Evans and Walker 1972). The index X_i^1 is given as:

$$X_i^1 = \sum_j \bar{H}_j^1 p_{ij} \tag{18}$$

which is a weighted average of the standardised complexity indexes $\bar{H}_j^1$ of each AR-DRG, where the weights p_{ij} are the share of the i*th*'s hospital's cases being classified as the j*th* AR-DRG.

To derive $\bar{H}_j^1$, the index of complexity for the j*th* AR-DRG is used:

$$H_j^1 = \sum_i q_{ij} \ln \left(\frac{q_{ij}}{\frac{1}{I}} \right) \tag{20}$$

Equation (20) describes the information gain rising from the probability of the j*th* AR-DRG being treated by the i*th* hospital. The smaller the q_{ij}, the larger will be its natural logarithm. Pre-multiplying gives the probability of that information gain occurring. If in the absence of any information of the actual distribution of cases, the probability of a case going to any hospital is the same for all hospitals, and is equal to the inverse of the number of hospitals 1/I.

H_j^1 is standardised to ensure that the index has a mean of one:

$$\bar{H}_j^1 = \frac{H_j^1}{\sum_j H_j^1 q_j} \tag{21}$$

This second measure of a hospital's relative complexity takes into account the relative differences in hospital size. In this index, it is assumed that the prior probability of a case occurring is equal to the actual proportion of all cases in the system treated by the hospital. This means that the larger the hospital, the higher will be the probability that it will treat a case entering the system (Butler 1995). While larger hospitals may treat more complex cases than smaller hospitals, they are also expected to treat more complex cases.

The second Evans and Walker index X_i^2 resembles the first, insofar that it is equal to the weighted average of standardised complexity cases $\bar{H}_j^2$:

$$X_i^2 = \sum_j \bar{H}_j^2 p_{ij} \tag{22}$$

However, the corresponding measure of information gain differs in that it is now influenced by the probability p_i that a case will go to the i*th* hospital is given by:

$$H_j^2 = \sum_i q_{ij} \ln\left(\frac{q_{ij}}{p_i}\right) \tag{23}$$

As with the first index, equation (23) is standardised to ensure that the index has a mean of one:

$$\bar{H}_j^2 = \frac{H_j^2}{\sum_j H_j^2 q_j} \tag{24}$$

What is the Commission measuring?

In this study, the Commission has compared the performance of all acute hospitals in one sample. That is, all hospitals — large and small, urban and rural — were compared in a single multivariate analysis. The typical practice in benchmarking is to identify relevant 'peers' against which hospital can be compared. For example, large metropolitan teaching hospitals are compared against other large metropolitan teaching hospitals, in order to learn about ways these hospitals might improve their performance. This practice of stratifying the sample according to key hospital characteristics, however, is not necessarily useful in an analytical context, because it cannot address an important research question: how significant are factors such as location and size in determining a hospital's performance? How can the impact of a hospital's size or location on efficiency be assessed if hospitals are only compared with those of the same size or location?

The Commission's analysis therefore is based on a pooled sample of all hospitals in the study, as the econometric model is designed to account for differences in hospitals which would typically be used to define 'peer groups'. For example, the inclusion of the explanatory variables measuring hospital size, location, teaching status and emergency services is designed to control for the effects of these factors on hospital output and efficiency. Using the stochastic frontier regression technique, the model can identify variation in hospital output that is specifically due to the inefficient use of inputs, and not due to differences in a hospital establishment's characteristics.

E.5 The results

Before attempting to estimate the technical efficiencies, the Commission undertook to identify a suitable measure of the quality of hospital care. The approach used here was to risk-adjust in-hospital mortality rates using a Tobit regression, and then to include the estimated risk-adjusted mortality ratios (RAMRs) into the estimation of hospital performance.

Risk-adjustment analysis

As noted earlier, in-hospital mortality is probably the only reliably measured hospital health outcome. Other measures, such as adverse events and infections, are generally not well reported. But, mortality rates do not always provide an indication of the quality of care in a hospital — a number of other factors outside the control of hospitals (such as the patient's comorbidities) can contribute to patient mortality.

Three sets of Tobit regressions were analysed. Model 1 considered each of the major categories of variables — patient comorbidities, socioeconomic status, place of residence, gender, Indigenous status and age profile. Model 2 excludes gender and the younger age profiles which appear to be insignificant as a group. It tests specifically for the effect of place of residence. Model 3 is identical to model 2 apart from replacing the place of residence variables with socioeconomic status of the patient (table E.4).

Table E.3 **Description and summary statistics of variables, 2006-07**[a]

Variable	*Description*	*Mean*	*Std. dev.*
Hospital outputs — Admitted patients			
Number of separations	Total number of separations	11 549.38	15 382.78
Acute separations	Number of casemix-adjusted separations (defined by MDC)	9 526.72	14 786.51
Pregnancy and neonate separations	Number of casemix-adjusted separations (defined by MDC)	1 175.80	2 557.90
Mental and alcohol separations	Number of casemix-adjusted separations (defined by MDC)	536.67	1 021.36
MDC 10 separations	Number of casemix-adjusted separations (defined by MDC)	267.68	427.37
Other separations	Number of casemix-adjusted separations (defined by MDC)	526.80	908.15
Average cost weight	Ratio	0.8953	0.370
Hospital outputs — Non-admitted patient services			
Accident and emergency services	Number of occasions of service	11 436.72	16 190.93
Allied health and dental services	Number of occasions of service	26 842.13	63 441.71
Mental and alcohol services	Number of occasions of service	536.67	1 021.36
Dialysis and endoscopy services	Number of occasions of service	158.19	1 457.82
Community outreach and district nursing services	Number of occasions of service	7 526.32	22 949.87
Pathology and radiology services	Number of occasions of service		
Hospital inputs			
Nursing staff	Number of full-time equivalents	211.96	339.17
Diagnostic staff	Number of full-time equivalents	63.55	145.77
Other staff	Number of full-time equivalents	141.88	243.78
Total beds	Total number	118.03	151.22
Drug costs	$'000s	306.47	13.09
Other hospital costs	$'000s	1 934.16	11.88
Medical and surgical supplies cost	$'000s	606.21	14.58

(Continued next page)

Table E.3 (continued)

Variable	*Description*	*Mean*	*Std. dev.*
Roles and functions			
Teaching	Dummy variable (1=yes; 0=otherwise)	0.3209	0.4673
Network	Dummy variable (1=yes; 0=otherwise)	0.0846	0.2786
Share of patients that were not public patients	Share of total separations	0.3915	0.3804
Surgical and other DRGs	Share of total separations	0.3104	0.2387
Same-day separations	Share of total separations	0.4585	0.1785
Accident and emergency rate	Ratio to total separations	2.1304	2.8140
Transfers to aged care	Share of total separations	0.0102	0.0164
Transfers to acute hospitals	Share of total separations	0.0687	0.0622
Transfers to other hospitals	Share of total separations		
Evans and Walker Index 1	Rate	0.5557	0.5241
Evans and Walker Index 2	Rate	0.4904	0.4211
Palliative-care unit	Dummy variable (1=yes; 0=otherwise)	0.1122	0.3159
High intensive care unit	Dummy variable (1=yes; 0=otherwise)	0.1772	0.3822
Residential care unit	Dummy variable (1=yes; 0=otherwise)	0.0039	0.0627
Patient characteristics			
Female patients	Share of total patients	0.5372	0.0800
Aged less than 1year	Share of total patients	0.0191	0.0325
Aged 1-4 years	Share of total patients	0.0252	0.0438
Aged 5-14 years	Share of total patients	0.0346	0.0526
Aged 50-59 years	Share of total patients	0.1334	0.0511
Aged 60-69 years	Share of total patients	0.1451	0.0516
Aged 70+ years	Share of total patients	0.2866	0.1395
From major city	Share of total patients	0.3880	0.4279
From inner regional	Share of total patients	0.3187	0.3591
From outer regional	Share of total patients	0.2124	0.3250
From remote	Share of total patients	0.0376	0.1427
From very remote	Share of total patients	0.0433	0.1782

(Continued next page)

Table E.3 (continued)

Variable	*Description*	*Mean*	*Std. dev.*
SEIFA 1	Share of total patients	0.3352	0.3464
SEIFA 2	Share of total patients	0.2326	0.2854
SEIFA 3	Share of total patients	0.1819	0.2272
SEIFA 4	Share of total patients	0.1354	0.1851
SEIFA 5	Share of total patients	0.1149	0.1974
Charlson score 1	Share of total patients	0.0819	0.0448
Charlson score 2	Share of total patients	0.0997	0.1014
Charlson score 3	Share of total patients	0.0150	0.0134
Charlson score 4	Share of total patients	0.0133	0.0262
Charlson score 5	Share of total patients	0.0317	0.0523
Charlson score 6 or higher	Share of total patients	0.0050	0.0079
Average Charlson score	Score	0.5396	0.4481
Quality indicator			
Mortality rate	Rate	0.0133	0.0310

[a] Statistics for the minimum and maximum observations were suppressed for confidentiality reasons.

Source: Unpublished ABS and AIHW data; Productivity Commission estimates.

Between the three models, patient characteristics prove to have a significant influence on hospital mortality rates. In particular, hospitals which have proportionally more patients in older age-groups (70 years or older), with higher Charlson scores (5 or over), and that identify with Indigenous status are expected to report higher mortality rates. Hospitals' patient profiles according to patient gender, usual place of residence, and socio-economic status (the latter based on the SEIFA) were not found to be significant in most cases (table E.4).

In terms of overall fit (log likelihood) and parsimony of variable choice (Akaike and Bayesian Information Criteria tests), there is little to separate the three models. The younger age profiles and gender were generally poor explanators, and so were dropped from the analysis altogether. The choice between models 2 and 3 is almost arbitrary. The residuals of the third model were used for the predicted mortality rates in table E.5.

The predicted and RAMRs are reported in table E.5 for private, public and public contract hospitals. A RAMR value less than one indicates that a hospital's actual mortality rate is less than predicted, given its patient profile, while a value greater than one indicates the reverse. On average, the private hospitals in this study reported lower RAMRs than public and public contract hospitals. It is of interest to note that the RAMRs of public contract hospitals are slightly lower than public hospitals, with whom they are likely to share a similar pattern of activity. The RAMRs are further disaggregated in table E.6 according to hospital size.

Care needs to be taken when interpreting RAMRs in relation to hospital quality. For example, the average RAMR for public hospitals (0.632) does not mean that patients die at twice the rate than in private hospitals (0.305) (table E.5). The purpose of the regression is to adjust hospital mortality rates for the profile of patients they treat. The Tobit regression is only intended to provide an indication of the extent to which patient-risk characteristics influence hospital mortality rates, and are not designed to account for the different activities that hospitals undertake (that is, their casemix). The estimated mortality ratios are then used as a control for quality in the output regression. Variables to measure a hospital's casemix are not included in the mortality rates regression, as they are already included as a direct component of the output stochastic frontier regression, and inclusion of these factors in the mortality rates is likely to generate collinearity.

The reported RAMRs should not be compared to other reported mortality measures (such as Hospital Standardised Mortality Rates, HSMRs).

Table E.4 **Results of Tobit regression of mortality rates, 2006-07**

Variable	*Model 1*		*Model 2*		*Model 3*	
Comorbidity						
Share of patients with Charlson 6 or more	2.817	***	2.810	***	2.829	***
Share of patients with Charlson 5	0.142	***	0.146	***	0.156	***
Share of patients with Charlson 4	-0.013		-0.011		0.007	
Share of patients with Charlson 3	-0.295	***	-0.292	***	-0.296	***
Share of patients with Charlson 2	-0.027	*	-0.027	*	-0.023	
Average Charlson score	-0.007		-0.001		-0.004	
Age						
Share of patients aged 70 or more	0.049	***	0.050	***	0.051	***
Share of patients aged between 60 and 69	-0.064	**	-0.064	***	-0.066	***
Share of patients aged between 50 and 59	-0.065	**	-0.061	***	-0.058	**
Share of patients aged between 5 and 14	-0.019					
Share of patients aged between 1 and 4	0.026					
Share of patients aged under 1	-0.017					
Indigenous status	0.008		0.010	***	0.013	**
Female	0.007					
Patient's usual place of residence						
Proportion of patients from inner regional areas	0.005		0.004	*		
Proportion of patients from outer regional areas	0.009	**	0.008	***		
Proportion of patients from remote areas	0.009		0.008			
Proportion of patients from very remote areas	0.006		0.005			
SEIFA classification of patient's residence						
Proportion of SEIFA 4	0.002				0.001	
Proportion of SEIFA 3	0.003				0.005	
Proportion of SEIFA 2	0.000				0.005	
Proportion of SEIFA 1	0.002				0.008	*
Constant	-0.004		0.000		0.001	
Sigma	0.018	***	0.017	***	0.018	***
Model criteria						
Log likelihood	1 244.94		1 244.33		1 241.81	
Likelihood Ratio χ^2	591.10		589.89		584.84	
Probability > χ^2	0.0000		0.0000		0.0000	
Akaike Information Criterion	-2 441.9		-2 456.6		-2 450.5	
Bayesian Information Criterion	-2 340.3		-2 388.9		-2 382.8	
No. of observations	508		508		508	

*** Significant at the 1 per cent critical level. ** Significant at the 5 per cent critical level. * Significant at the 10 per cent critical level.

Source: Unpublished ABS and AIHW data; Productivity Commission estimates.

Table E.5 Predicted mortality rates and risk-adjusted mortality ratios, by sector, 2006-07

	Public hospitals	*Public contract hospitals*	*Private hospitals*	*All hospitals*
Predicted mortality rates				
Mean	0.022	0.030	0.022	0.022
Median	0.019	0.017	0.015	0.018
Standard deviation	0.010	0.040	0.041	0.023
Minimum	0.007	0.012	0.006	0.006
Maximum	0.083	0.186	0.434	0.434
Weighted average[a]	0.023	0.032	0.019	0.023
RAMRs[b]				
Mean	0.632	0.540	0.305	0.550
Median	0.593	0.420	0.189	0.517
Standard deviation	0.380	0.563	0.324	0.399
Minimum	–	0.074	–	–
Maximum	2.793	2.583	1.860	2.793
Weighted average[a]	0.530	0.383	0.327	0.471
Number of observations	368	18	122	508

a Weighted average by casemix-adjusted separations. **b** RAMR – Risk-adjusted mortality ratio is equal to the actual (observed) mortality rate divided by the predicted mortality rate. – Nil or rounded to zero.

Source: Unpublished ABS and AIHW data; Productivity Commission estimates.

Table E.6 **Risk-adjusted mortality ratios, by sector and hospital size, 2006-07[a]**

	Very large	*Large*	*Medium*	*Very small and small*	*All*
Public hospitals					
Mean	0.506	0.472	0.532	0.718	0.632
Median	0.506	0.441	0.481	0.685	0.593
Standard deviation	0.195	0.269	0.325	0.431	0.380
Minimum	0.072	–	–	–	–
Maximum	0.889	1.043	1.590	2.793	2.793
Number of observations	68	37	45	218	368
Public contract hospitals					
Mean	np	np	np	np	0.540
Median	np	np	np	np	0.420
Standard deviation	np	np	np	np	0.563
Minimum	np	np	np	np	0.074
Maximum	np	np	np	np	2.583
Number of observations	np	np	np	np	18
Private hospitals					
Mean	0.357	0.316	0.274	0.297	0.305
Median	0.340	0.236	0.185	0.064	0.189
Standard deviation	0.256	0.267	0.270	0.432	0.324
Minimum	–	–	–	–	–
Maximum	0.908	0.908	0.908	1.860	1.860
Number of observations	24	22	38	38	122
All hospitals					
Mean	0.457	0.432	0.414	0.662	0.550
Median	0.469	0.415	0.330	0.636	0.517
Standard deviation	0.221	0.277	0.390	0.465	0.399
Minimum	–	–	–	–	–
Maximum	0.908	1.124	1.691	2.793	2.793
Number of observations	np	np	np	np	508

a RAMR – Risk-adjusted relative mortality ratio is equal to the actual (observed) mortality rate divided by the predicted mortality rate. **np** Not published due to confidentiality concerns. – Nil or rounded to zero.

Source: Unpublished ABS and AIHW data; Productivity Commission estimates

Stochastic frontier analysis

Two distinct types of production (distance) functions were modelled using the 2006-07 data — a Cobb-Douglas and a restricted translog function (as it was not technically possible to solve the full version of the translog function). The results for a number of versions of the Cobb-Douglas and a restricted translog are presented in tables E.7 and E.8.

Table E.7 **Results of Cobb-Douglas stochastic frontier analysis, 2006-07**

	Model 1		*Model 2*		*Model 3*		*Model 4*		*Model 5*	
Primary model										
Inpatient services										
Log of acute separations	-0.546	***	-0.542	***	-0.488	***	-0.545	***	-0.506	***
Log of preg. & neonate seps.	-0.057	***	-0.014		-0.066	***	-0.059	***	-0.060	***
Log of mental & alcohol seps.	-0.102	***	-0.108	***	-0.121	***	-0.100	***	-0.106	***
Log of other separations	-0.146	***	-0.186	***	-0.146	***	-0.144	***	-0.151	***
Non-admitted services										
Log of emergency dept. visits	-0.014	*	0.009		-0.022		-0.011		-0.021	
Log of allied & dental services	-0.044	***	-0.080	***	-0.048	**	-0.049	***	-0.050	***
Log of mental & alcohol serv.	-0.011		0.001		-0.006		-0.013		-0.011	
Log of outreach & dist. nurs.	0.002		-0.005		0.003		0.004		0.004	
Log of diagnostic services	-0.038	**	-0.013		-0.041	***	-0.037	**	-0.041	***
Log of dialysis & endoscopy	0.036		0.010		0.057		0.027		0.031	
Quality										
RAMR	-0.035		0.057		0.022		-0.017			
Inputs										
Log of nursing staff	0.177	***	0.268	***	0.187	***	0.188	***	0.241	***
Log of diag. staff	0.033	*	0.092	***	0.024		0.032		0.030	
Log of other staff	-0.147	***	-0.006		-0.120	**	-0.140	**	-0.161	***
Log of beds	0.436	***	0.681	***	0.443	***	0.449	***	0.462	***
Log of drugs	0.064	**	-0.036		0.075	***	0.061	**	0.068	***
Log of med.& surg. supplies	0.025		0.142	***	0.017		0.020		0.015	
Log of other inputs	-0.016		-0.088	***	-0.018		-0.008		-0.012	
Role and functions										
Emergency to admission ratio	0.008									
Teaching hospital	0.100				0.106		0.097		0.116	*
Level III ICU	0.004				0.013					
Palliative care unit	-0.026				0.007					
Residential care unit	-0.187				-0.171					
Evans & Walker Index 1	-1.997	***			-2.030	***	-2.015	***	-2.098	***
Evans & Walker Index 2	3.970	***			4.029	***	3.944	***	4.011	***
% of seps surgical or other	1.117	***			0.958	***	1.152	***	1.131	***
% non-public patients	-1.089	***			-1.118	***	-1.123	***	-1.160	***
Patient characteristics										
% with Charlson 6 +	-0.866		8.763				-1.912		-6.518	**
% with Charlson 5	0.710		2.677				0.825		-1.520	**
% with Charlson 4	-0.584		2.200				-0.712		-2.641	***
% with Charlson 3	0.717		0.021				0.915			
% with Charlson 2	1.025		2.691	**			1.036			
Average Charlson	-0.062		-0.729				-0.072		0.394	***

(Continued next page)

Table E.7 (continued)

	Model 1		Model 2		Model 3		Model 4		Model 5	
Patient SEIFA										
% from SEIFA 4	-0.045		0.429	**			-0.045			
% from SEIFA 3	-0.245	*	0.235				-0.251	*	-0.307	***
% from SEIFA 2	-0.228		0.198				-0.233		-0.332	***
% from SEIFA 1	-0.162		0.314	**			-0.173		-0.261	***
Patient place of residence[a]										
Major city	0.378	***	0.137				0.248	**		
Outer regional	0.498	***	0.016				0.114			
Remote	0.826	***	-0.066				0.052			
Very remote	0.475		-0.078				-0.098			
Hospital location[a]										
Major city	-0.078				0.149	**				
Outer regional	-0.350	***			-0.002					
Remote	-0.720	***			-0.102					
Very remote	-0.576	*			-0.163					
State or territory[b]										
NSW	-0.087		-0.054		-0.083		-0.072		-0.090	
Victoria	-0.254	***	-0.161	**	-0.224	***	-0.253	***	-0.277	***
South Australia	-0.244	***	0.104		-0.224		-0.240	***	-0.230	***
Western Australia	-0.077		0.164		-0.037	**	-0.055		-0.069	
Tasmania	0.976	***	0.403		1.050	***	0.977	***	1.176	***
Northern Territory	-0.190		0.211		-0.105		-0.190		-0.217	
ACT	-0.123		-0.161		0.152		-0.129		-0.237	
Constant	3.802	***	2.683	***	3.521	***	3.747	***	3.644	***
Secondary model										
Log σ_v^2										
Constant	-2.664	***	-2.585	***	-2.452	***	-2.654	***	-2.543	***
Log σ_u^2										
Constant	-1.915	***	-1.289	***	-1.953	***	-1.866	***	-1.918	***
Model criteria										
No. of observations	508		508		508		508		508	
Log likelihood	-297.4		-400.6		-319.3		-305.3		-311.3	
Wald χ^2	7 969.7		5 215.4		6 997.2		7 663.4		7 345.2	
Probability $> \chi^2$	0.0000		0.0000		0.0000		0.0000		0.0000	
Akaike Inference Criterion	704.8		885.3		718.6		704.6		700.5	
Bayesian Inference Criterion	937.6		1062.9		887.8		903.4		865.5	
σ_v	0.264		0.275		0.295		0.265		0.280	
σ_u	0.384		0.525		0.376		0.393		0.383	
σ^2	0.217		0.351		0.228		0.225		0.226	
λ	1.454		1.911		1.283		1.483		1.367	

[a] Inner regional is the reference region. [b] Queensland is the reference jurisdiction. *** Significant at the 1 per cent level, ** Significant at the 5 per cent level, * Significant at the 10 per cent level.

Source: Unpublished ABS and AIHW data; Productivity Commission estimates.

Table E.8 **Results of translog stochastic frontier analysis, 2006-07**

	Model 6		*Model 7*		*Model 8*		*Model 9*		*Model 10*	
Primary model										
Inpatient services										
Log of acute separations	-0.302		-0.265		-0.160		-0.171		-0.211	
Log of acute seps – sq	-0.015		-0.022		-0.030		-0.029		-0.022	
Log of preg. & neonate seps	-0.049	***	-0.035	***	-0.049	***	-0.050	***	-0.052	***
Log of preg. & neon. – sq	-0.005		-0.009	***	-0.005		-0.004		-0.004	
Log of mental & alc.	-0.148	***	-0.167	***	-0.156	***	-0.155	***	-0.151	***
Log of mental & alc – sq	-0.019	***	-0.023	***	-0.020	***	-0.020	***	-0.019	***
Log of other seps	-0.096	***	-0.095	***	-0.087	***	-0.090	***	-0.103	***
Log of other seps – sq	-0.017	***	-0.029	***	-0.017	***	-0.017	***	-0.016	***
Non-admitted services										
Log of ED visits	-0.061		-0.099	**	-0.073	*	-0.074	*	-0.069	
Log of ED visits – sq	0.007		0.016	**	0.006		0.007		0.006	
Log of allied & dental	0.128	***	0.160	***	0.115	***	0.117	***	0.105	***
Log of allied & denta – sq	-0.027	***	-0.035	***	-0.026	***	-0.026	***	-0.024	***
Log of mental & alc	0.035	*	0.029		0.039	**	0.042	**	0.029	
Log of mental & alc – sq	-0.005	***	-0.001		-0.005		-0.005	**	-0.003	
Log of outreach & dist.	0.007		0.005		-0.004		-0.001		0.010	
Log of outreach – sq	0.001		0.001		0.002		0.002		0.000	
Log of diagnostic	-0.034		-0.044		-0.025		-0.029		-0.027	
Log of diagnostic – sq	0.003		0.004		0.000		0.001		0.000	
Log of dialysis & endoscopy	0.021		-0.013		0.071		0.025		0.014	
Log of dial & endo. – sq	-0.008	**	-0.018		0.006		-0.009		-0.018	
Quality										
RAMR	-0.256	*	-0.050		-0.200		-0.216			
RAMR – sq	0.109		0.015		0.087		0.090			
Inputs										
Log of nursing staff	0.533	***	0.708	***	0.664	***	0.657	***	0.678	***
Log of nursing staff - sq	-0.051	**	-0.058	**	-0.066	***	-0.066	***	-0.061	***
Log of diag. staff	0.032		0.087	***	0.029		0.030		0.036	
Log of diag. staff - sq	-0.004		-0.009		-0.006		-0.006		-0.003	
Log of other staff	-0.129		0.028		-0.163		-0.155		-0.152	
Log of other staff - sq	-0.002		-0.014		0.007		0.007		0.000	
Log of beds	-0.007		0.030	***	0.032		0.039		0.075	
Log of beds - sq	0.075	***	0.092	***	0.071	***	0.069	***	0.068	***
Log of drugs	-0.010		-0.073	***	-0.005		-0.004	***	-0.005	
Log of drugs - sq	0.011	***	0.014	***	0.011	***	0.011	***	0.011	***
Log of med.& surg. supplies	0.290	***	0.175	**	0.246	***	0.238	***	0.246	***
Log of med. & surg. - sq	-0.027	***	-0.006		-0.023	***	-0.022	***	-0.022	***
Log of other inputs	-0.383	***	-0.423	***	-0.380	***	-0.375		-0.380	***
Log of other inputs -sq	0.030	***	0.024	***	0.029	***	0.029	***	0.028	***
Role and functions										
Teaching hospital	0.168	***			0.176	***	0.185	***	0.196	***
Level III ICU	0.057				0.062					
Palliative care unit	-0.035				-0.025					

(Continued next page)

Table E.8 (continued)

	Model 6		Model 7		Model 8		Model 9		Model 10	
Residential care unit	-0.403				-0.610	*				
Evans & Walker Index 1	-2.047	***			-1.732	***	-1.574	***	-1.777	***
Evans & Walker Index 2	3.658	***			3.230	***	3.086	***	3.246	***
% non-public patients	-0.962	***			-0.998	***	-0.996	***	-0.993	***
% of seps surg. or other	0.856	***			0.767	***	0.761	***	0.862	***
Patient characteristics										
% with Charlson 6 +	-0.374		13.307	**					-7.362	**
% with Charlson 5	1.822		7.850	***					-1.121	
% with Charlson 4	0.692		6.384	***					-2.079	**
% with Charlson 3	1.235		4.308							
% with Charlson 2	1.424		4.271	***						
Average Charlson	-0.362		-1.769	***					0.250	**
Patient SEIFA										
% from SEIFA 4	-0.182		0.080							
% from SEIFA 3	-0.216		0.097						-0.216	**
% from SEIFA 2	-0.272	**	0.037						-0.322	***
% from SEIFA 1	-0.178		0.167						-0.238	***
Patient place of residence[a]										
Major city	0.409	***	0.122		0.190	***	0.191	***		
Outer regional	0.423	***	-0.008		-0.032		-0.034			
Remote	0.837	***	0.030		-0.147		-0.148			
Very remote	0.499		-0.084		-0.182	*	-0.188	*		
Hospital location[a]										
Major city	-0.070									
Outer regional	-0.332	***								
Remote	-0.757	***								
Very remote	-0.637	**								
State or territory[b]										
NSW	-0.089	*	-0.075		-0.088		-0.079		-0.098	
Victoria	-0.219	***	-0.137	*	-0.203	***	-0.212	***	-0.249	***
South Australia	-0.165	**	0.089		-0.141		-0.144	*	-0.134	
Western Australia	0.007		0.207	**	0.034		0.026		0.009	
Tasmania	0.737	**	-0.411		0.937	***	0.938	***	1.001	***
Northern Territory	-0.356	**	-0.031		-0.227		-0.229		-0.342	*
ACT	-0.171		-0.167		0.054		0.056		-0.253	
Constant	3.864	***	3.578	***	3.281	***	3.323	***	3.318	***
Secondary model										
Log σ_v^2										
Constant	-2.744	***	-2.646	***	-2.500	***	-2.511	***	-2.495	***
Log σ_u^2										
Constant	-2.430	***	-1.961	***	-2.553	***	-2.520	***	-2.560	***

(Continued next page)

Table E.8 (continued)

	Model 6	*Model 7*	*Model 8*	*Model 9*	*Model 10*
Model criteria					
No. of observations	508	508	508	508	508
Log likelihood	-305.3	-292.6	-242.9	-244.7	242.2
Wald χ^2	7 663.4	8 637.8	9 650.9	9 584.7	9 830.1
Probability $> \chi^2$	0.0000	0.0000	0.0000	0.0000	0.0000
Akaike Inference Criterion	704.6	705.9	601.8	599.4	596.1
Bayesian Inference Criterion	903.4	959.7	847.2	832.0	833.2
σ_v	0.254	0.266	0.287	0.285	0.287
σ_u	0.297	0.375	0.279	0.284	0.278
σ^2	0.152	0.212	0.160	0.162	0.160
λ	1.171	1.408	0.973	0.996	0.968

a Inner regional is the reference region. **b** Queensland is the reference jurisdiction. **sq** Indicates a squared term. *** Significant at the 1 per cent level, ** Significant at the 5 per cent level, * Significant at the 10 per cent level.

Source: Unpublished ABS and AIHW data; Productivity Commission estimates

Models 1 and 6 include all the variables available for each of the functional forms. Models 2 and 7, respectively, include outputs and inputs as well as the major patient-risk characteristics (such as Charlson comorbidity scores, SEIFA indices). They do not include those variables that describe the roles and functions of hospitals. It is worth noting the high degree of collinearity between these variables and the RAMR (which includes a number of these variables in its estimation).

Models 3 and 8 include the hospital outputs and inputs, the RAMR and all the variables describing hospital roles and functions and hospital location. It is worth observing that dummy variables indicating the presence of intensive care, palliative care and residential aged care units were not significant. The coefficients for both Evans and Walker indices confirm that the complexity of hospital services is a determinant of the dependent variable. Models 4 and 9 are similar to models 3 and 8 but with selected hospital roles and function variables excluded.

In models 5 and 10, the RAMR is replaced by the patient-risk characteristics. Not all of the Charlson and SEIFA variables were included, as collinearity was evident within members of each set. Models 5 and 10 reflect the synthesis of models 3 and 4, and 8 and 9 respectively. The Akaike and Bayesian information criteria tests indicate that models 5 and 10 are to be preferred, followed by models 4 and 9, for the Cobb-Douglas and restricted translog functions respectively.

In interpreting the coefficients (from models 5 and 10), the following observations can be made:

- Hospitals that treat relatively more comorbid partients (Charlson index) and patients from more disadvantage areas (SEIFA index) have lower frontiers (best-practice benchmarks).
- Hospitals that treat relatively more non-public patients (that is, patients who elect to be funded by private health insurance, the Department of Veterans' Affairs, third-party motor vehicle accident schemes or are self-funded) tend to have lower frontiers. This may reflect the additional resources employed by hospitals to treat these patients.
- Hospitals that undertake relatively more surgical and other procedures (as opposed to medical procedures) tend to have higher frontiers. This may be because that medical procedures are inherently more difficult to manage, possibly because of their relatively unplanned nature.
- The coefficients for Victoria and Tasmania remain relatively significant in all specifications. This is likely to reflect the effects of having to disaggregate the data for these jurisdictions from a single public hospital observation.

Other variables, such as average length of stay and the proportion of same-day separations, were not considered in the analysis because shorter lengths of stay and higher turnover of patients is reflected in the greater level of inpatient separations.

Efficiency results

Efficiency results are presented in tables E.9 to E.11 for models 4, 5, 9 and 10. After taking into account the various factors that influence their performance, the average efficiency of all hospitals was broadly similar. The mean technical efficiencies across the major hospital categories (public, private, public contract) were between 0.75 to 0.80 (models 9 and 10) (table E.9). The median efficiencies across the same categories ranged between 0.81 and 0.83 (model 9), and between 0.81 and 0.84 (model 10), suggesting a degree of skewness in efficiency scores (table E.9).

The use of the translog functional form is intended to 'net out' the effects of scale economies, although using the mean efficiency scores, it is possible to discern differences in the technical efficiencies of hospitals of different size. For example, the mean technical efficiency score was about 0.766 for the smallest hospitals (table E.11, model 10) and 0.814 for very large hospitals (table E.10, model 10).

The median is a better measure of central tendency than the mean, given the skewness in the data. There is a perceptible difference between the major hospital categories. The median technical efficiency score for large and very large private hospitals was slightly higher than for public hospitals, except for large hospitals in model 9 (table E.10). For example, the median technical efficiency of large and very large private hospitals was 0.829 and 0.851 respectively, compared to 0.812 and 0.820 for public hospitals of the same size (model 10, table E.10).

Table E.9 **Technical efficiency scores, all hospitals, 2006-07**[a]

	Model 4	*Model 5*	*Model 9*	*Model 10*
All hospitals				
Mean	0.729	0.732	0.783	0.786
Median	0.772	0.776	0.814	0.816
5th percentile	0.366	0.408	0.501	0.553
95th percentile	0.895	0.893	0.904	0.906
No. of observations	508	508	508	508
Public hospitals				
Mean	0.743	0.746	0.794	0.797
Median	0.771	0.774	0.814	0.816
5th percentile	0.478	0.503	0.627	0.643
95th percentile	0.890	0.886	0.902	0.901
No. of observations	368	368	368	368
Private hospitals				
Mean	0.677	0.680	0.746	0.750
Median	0.771	0.785	0.817	0.822
5th percentile	0.092	0.105	0.311	0.313
95th percentile	0.905	0.905	0.913	0.916
No. of observations	122	122	122	122
For-profit hospitals				
Mean	0.663	0.667	0.749	0.751
Median	0.765	0.777	0.816	0.818
5th percentile	0.062	0.079	0.311	0.313
95th percentile	0.911	0.909	0.918	0.917
No. of observations	94	94	94	94
Not-for-profit hospitals				
Mean	0.721	0.722	0.736	0.747
Median	0.797	0.796	0.828	0.838
5th percentile	0.110	0.136	0.175	0.203
95th percentile	0.880	0.888	0.898	0.906
No. of observations	28	28	28	28
Public contract hospitals				
Mean	0.791	0.787	0.801	0.800
Median	0.826	0.814	0.818	0.805
5th percentile	0.511	0.523	0.580	0.583
95th percentile	0.911	0.906	0.907	0.908
No. of observations	18	18	18	18

a Results based on models 4 and 5 (Cobb-Douglas) and models 9 and 10 Logarithmic quadratic. The 5% and 95% percentile values are equivalent to the minimum and maximum scores after removing for the outliers in the estimated distribution.

Table E.10 **Technical efficiency scores, large and very large hospitals, 2006-07**[a]

	Large hospitals				*Very large hospitals*			
	Model 4	*Model 5*	*Model 9*	*Model 10*	*Model 4*	*Model 5*	*Model 9*	*Model 10*
All hospitals								
Mean	0.776	0.776	0.807	0.809	0.761	0.763	0.814	0.814
Median	0.793	0.799	0.827	0.828	0.765	0.770	0.814	0.827
5th percentile	0.565	0.556	0.656	0.644	0.587	0.585	0.715	0.683
95th percentile	0.892	0.891	0.907	0.908	0.895	0.890	0.908	0.905
No. of obs.	70	70	70	70	98	98	98	98
Public hospitals								
Mean	0.763	0.764	0.808	0.810	0.750	0.754	0.811	0.813
Median	0.785	0.773	0.826	0.812	0.756	0.762	0.810	0.820
5th percentile	0.567	0.581	0.668	0.648	0.557	0.585	0.729	0.708
95th percentile	0.886	0.891	0.917	0.917	0.895	0.893	0.908	0.905
No. of obs.	37		37	37	68	68	68	68
Private hospitals								
Mean	0.788	0.789	0.810	0.813	0.785	0.784	0.823	0.819
Median	0.827	0.827	0.824	0.829	0.805	0.811	0.850	0.851
5th percentile	0.662	0.644	0.751	0.752	0.647	0.645	0.670	0.655
95th percentile	0.881	0.878	0.887	0.878	0.885	0.879	0.894	0.893
No. of obs.	22	22	22	22	24	24	24	24
For-profit hospitals								
Mean	0.780	0.784	0.808	0.810	0.793	0.793	0.839	0.834
Median	0.823	0.823	0.824	0.828	0.827	0.821	0.858	0.863
5th percentile	0.565	0.558	0.465	0.457	0.587	0.586	0.689	0.659
95th percentile	0.892	0.889	0.920	0.918	0.893	0.891	0.918	0.917
No. of obs.	15	15	15	15	15	15	15	15
Not-for-profit hospitals								
Mean	0.807	0.799	0.815	0.819	0.772	0.770	0.797	0.795
Median	0.831	0.832	0.830	0.830	0.801	0.795	0.825	0.846
5th percentile	0.739	0.699	0.751	0.757	0.647	0.651	0.643	0.639
95th percentile	0.851	0.850	0.858	0.868	0.852	0.847	0.876	0.877
No. of obs.	7	7	7	7	9	9	9	9

a Results based on models 4 and 5 (Cobb-Douglas) and models 9 and 10 Logarithmic quadratic. The 5% and 95% percentile values are equivalent to the minimum and maximum scores after removing for the outliers in the estimated distribution.

Table E.11 **Technical efficiency scores, small and very small, and medium hospitals, 2006-07[a]**

	Small and very small hospitals				Medium hospitals			
	Model 4	*Model 5*	*Model 9*	*Model 10*	*Model 4*	*Model 5*	*Model 9*	*Model 10*
All hospitals								
Mean	0.701	0.708	0.762	0.766	0.738	0.746	0.791	0.741
Median	0.771	0.766	0.808	0.806	0.765	0.777	0.819	0.780
5th percentile	0.173	0.202	0.378	0.415	0.506	0.499	0.557	0.491
95th percentile	0.890	0.879	0.902	0.899	0.913	0.915	0.915	0.915
No. of obs.	257	257	257	257	83	83	83	83
Public hospitals								
Mean	0.737	0.739	0.786	0.788	0.748	0.754	0.797	0.803
Median	0.776	0.781	0.815	0.816	0.762	0.760	0.812	0.815
5th percentile	0.404	0.408	0.556	0.575	0.528	0.558	0.607	0.622
95th percentile	0.889	0.880	0.895	0.897	0.904	0.901	0.915	0.907
No. of obs.	218	218	218	218	45	45	45	45
Private hospitals								
Mean	0.495	0.505	0.622	0.641	0.725	0.727	0.785	0.780
Median	0.601	0.605	0.694	0.700	0.798	0.803	0.838	0.841
5th percentile	0.046	0.063	0.175	0.203	0.103	0.118	0.448	0.427
95th percentile	0.907	0.909	0.916	0.919	0.925	0.926	0.928	0.931
No. of obs.	38	38	38	38	38	38	38	38
For-profit hospitals								
Mean	0.471	0.480	0.628	0.640	0.732	0.734	0.797	0.791
Median	0.607	0.605	0.716	0.715	0.795	0.802	0.826	0.820
5th percentile	0.046	0.063	0.186	0.208	0.178	0.205	0.503	0.470
95th percentile	0.907	0.908	0.916	0.916	0.925	0.926	0.928	0.931
No. of obs.	31	31	31	31	33	33	33	33
Not-for-profit hospitals								
Mean	0.598	0.614	0.597	0.642	0.679	0.682	0.707	0.707
Median	0.596	0.606	0.634	0.644	0.878	0.883	0.874	0.876
5th percentile	0.110	0.136	0.175	0.203	0.028	0.031	0.029	0.029
95th percentile	0.875	0.875	0.913	0.919	0.905	0.908	0.898	0.906
No. of obs.	7	7	7	7	5	5	5	5

a Results based on models 4 and 5 (Cobb-Douglas) and models 9 and 10 Logarithmic quadratic. The 5% and 95% percentile values are equivalent to the minimum and maximum scores after removing for the outliers in the estimated distribution.

These differences in the means and medians are relatively small, particularly when it is recognised that there are significant variations within each group of hospitals. For example, the range between the 5th and 95th percentile for very large private hospitals is 0.655 and 0.893 (model 10, table E.10). This implies that the differences in the means between very large public and private hospitals may be negligible. That said, in terms of median scores, the relative rankings between public and private hospitals remained the same, regardless of the functional form

(Cobb-Douglas and restricted translog) and choice of variables, with the exception of large hospitals in model 9 (table E.10).

In contrast, the median efficiencies of very small and small private hospitals were lower than for public hospitals (for example, the efficiency scores of very small and small private hospitals efficiency was 0.700 compared to 0.816 for public hospitals, for model 10, table E.11). The greater dispersion of efficiency among small and very small private hospitals, for example with efficiencies between 0.203 and 0.919 in model 10 (compared with public hospitals 0.575 to 0.897) suggests a degree of variability that has not been adequately captured in the model.

Finally, some correlation statistics were calculated for three variables of interest on the efficiency scores (table E.12). Occupancy rates were positively correlated with efficiency scores for all hospitals, public and private, and to some extent, public contract hospitals. Average length of stay (ALOS) is an important contributor to private hospital efficiency — hospitals with higher ALOS were less efficient. Finally complexity, as measured by cost weights, indicated that public hospitals with the higher cost weights were more efficient, while the private hospitals with the lower cost weights were more efficient.

Table E.12 **Correlation coefficients between selected variables and technical efficiency scores**

	Model 4	*Model 5*	*Model 9*	*Model 10*
Occupancy rate				
All hospitals	0.1616*	0.3222*	0.2162*	0.3361*
Publics	0.2264*	0.2333*	0.2386*	0.2555*
Privates	0.1855*	0.1964*	0.2899*	0.3051*
Public contract	0.3517	0.3279	0.5356*	0.4973*
ALOS				
All hospitals	-0.2749*	-0.3530*	-0.2411*	-0.3913*
Publics	0.0981	0.0752	0.0725	0.0920
Privates	-0.4564*	-0.4478*	-0.3954*	-0.3606*
Public contract	0.1809	0.1762	0.3313	0.3720
Cost weight				
All hospitals	-0.0800	-0.2390*	-0.0186	-0.1890*
Publics	0.2151*	0.1799*	0.2236*	0.2344*
Privates	-0.3242*	-0.3254*	-0.2005*	-0.1847*
Public contract	-0.0934	-0.1333	0.0186	0.0924

*Significant at the 5 per cent level.

Source: Unpublished ABS and AIHW data; Productivity Commission estimates

E.6 Proposed future analysis

Given the data delays faced by the Commission, the multivariate analysis presented in this report estimates hospital production functions and technical efficiency based on a single year of data (2006-07). Given the large number of hospital observations in this data set, the results are expected to be robust.

Nevertheless, the Commission intends over coming months to replicate this analysis using a larger data set that includes data from the earlier years of 2003-04 to 2005-06. Future analysis will also focus on examining the performance of hospitals for different peer groups (say, to compare the performance of very large hospitals). The Commission will also extend this analysis to examine the determinants of hospital costs.

The Commission intends to publish the results from this further analysis in March 2010.

F State-level data on hospital-acquired infections

Government monitoring of hospital-acquired infections is largely undertaken by state governments, reflecting their role as providers of public hospitals and regulators of private hospitals. Such monitoring is not done on a nationally-consistent basis, but public and private hospitals are included in most cases.

New South Wales is the only state with a dedicated infection surveillance program under which the data reported to government are limited to public hospitals.[1] The Northern Territory Government also confines its infection monitoring to public hospitals.[2] The ACT Government collects data from just one private hospital and two public hospitals, and so it would not be possible to maintain confidentiality in a public-private comparison.[3] Nevertheless, it is likely that hospitals that are not required to report data to governments would still monitor their infection rates and participate in voluntary cross-hospital reporting programs, such as the Clinical Indicator Program (CIP) managed by the Australian Council on Healthcare Standards.

The Commission did not request infections data from individual hospitals (or groups of hospitals managed by the same entity) because it would be difficult to maintain confidentiality, and the collection methods and definitions may not be

1 The NSW Government's infection surveillance program is mandatory for public hospitals (NSW Department of Health 2005). Reported data include surgical-site infections following selected procedures, central-line associated bloodstream infections, *Staphylococcus aureus* bacteraemia, and methicillin-resistant *Staphylococcus aureus* cases in intensive-care units (NSW Department of Health 2008). Private hospitals are encouraged to use the same indicator framework and should report data to their infection control and/or quality committee, and medical advisory committee.

2 NT public hospitals submit infections data to the Clinical Indicator Program, which is managed by the Australian Council on Healthcare Standards.

3 The ACT Government routinely collects data on bloodstream infections, and surgical-site infections associated with selected procedures (joint arthroplasty, cardiac surgery and caesarean sections) (Bull et al. 2008).

comparable with other hospitals (or groups). Data was not requested from the CIP, given the limitations with that information source (discussed in chapter 6).

F.1 Victoria

There are two potential sources of infections data in Victoria:

- Victorian Nosocomial Infection Surveillance System (VICNISS)
- Victorian Admitted Episodes Dataset (VAED).

Victorian Nosocomial Infection Surveillance System

VICNISS was established in 2002 and is funded by the Victorian Government to monitor infections in public hospitals. The VICNISS Coordinating Centre collects and analyses data from individual hospitals, and reports quarterly to participating hospitals and the Victorian Department of Health.

All public hospitals report to VICNISS. Private hospitals recently expressed an interest in also participating, and this has so far led to seven private hospitals reporting data. The Commission understands that all of these are larger private hospitals (more than 100 beds). It is expected that this development will 'eventually enable a comprehensive data collection of surgical procedures in Victoria and allow comparisons between all hospitals, both public and private' (Victorian Department of Human Services 2008b, p. iv).

VICNISS surveillance methods differ according to hospital size. Hospitals with 100 or more beds (type-1 hospitals) are subject to three components based on the US NNIS system. These components are the surveillance of surgical-site infections (SSIs), intensive-care units (ICUs) and neonatal ICUs. VICNISS uses the NHSN/NNIS risk index (described in box 6.1) to risk adjust SSI rates, although the methodology is modified for operations where the use of a laparoscope influences the risk of developing an SSI (for example, appendectomy and cholecystectomy) (Victorian Department of Human Services 2008b). The most recent published data for SSIs are shown in table F.1.

Surveillance for hospitals with fewer than 100 beds (type-2 hospitals) involves monitoring processes that have been demonstrated to affect outcomes and, for hospitals with high surgical throughput, reporting selected infection rates. While the prevalence of MRSA is not reported for type-1 hospitals, it is one of the infection rates that type-2 hospitals can report. The VICNISS Coordinating Centre stratifies the type-2 hospital data into small hospitals (1–14 acute beds), medium hospitals

(15–49 acute beds) and large hospitals (50–99 acute beds) and reports infections per occupied bed day. Data for type-2 hospitals on rates of methicillin-resistant *Staphylococcus aureus* (MRSA) and bloodstream infections (BSIs) are shown in table F.2.

Table F.1 **SSI rates for Victorian public hospitals by procedure and risk category, 2007**[a]

	Risk category[b]			
	0	*1*	*2*	*3*
Coronary artery bypass grafts, deep and organ space	–	1.0 (0.5–1.7)	1.6 (0.7–3.2)	–
Colon surgery	–	4.9 (2.5–8.7)	9.5 (6.3–13.6)	11.2 (6.3–18.1)
Caesarean section	1.5 (1.1–1.9)	1.3 (0.6–2.5)	–	–
Hip arthroplasty deep and organ space	0.9 (0.4–1.7)	1.9 (1.3–2.7)	–	–
Knee arthroplasty deep and organ space	1.3 (0.6–2.4)	0.8 (0.3–1.6)	–	–

[a] Hospitals with 100 or more acute beds (VICNISS type-1 hospitals). SSI rates are expressed in terms of infections per 100 procedures. [b] Risk categories are based on the NHSN/NNIS risk index for SSIs (detailed in box 6.1). Numbers in parentheses are 95 per cent confidence intervals. – Nil or rounded to zero.

Source: Victorian Department of Health (unpublished VICNISS data).

Table F.2 **MRSA and BSI rates for Victorian public hospitals by hospital size, 2004–2007**[a]

Hospital size	*MRSA*[b]	*BSIs*[b]
1–14 acute beds	0.5 (0.2–0.8)	0.1 (0.0–0.3)
15–49 acute beds	0.4 (0.3–0.7)	0.3 (0.1–0.4)
50–99 acute beds	1.0 (0.8–1.4)	0.7 (0.5–0.9)
Total	0.7 (0.5–0.8)	0.4 (0.3–0.5)

[a] Hospitals with fewer than 100 acute beds (VICNISS type-2 hospitals). [b] Infection rates are expressed as infections per 10 000 occupied bed days. Numbers in parentheses are 95 per cent confidence intervals.

Source: Victorian Department of Human Services (2008b).

Victorian Admitted Episodes Dataset

The VAED contains data on all episodes of care for admitted patients in public and private hospitals in Victoria. Hospitals are required to provide these data to the Victorian Department of Health.

The Victorian Government provides data from the VAED to a national database — the National Hospital Morbidity Database (NHMD) managed by the Australian

Institute of Health and Welfare (AIHW) — as part of its healthcare agreement with the Australian Government. Other jurisdictions have similar arrangements with the Australian Government, and national coding standards have been established to ensure data are reported consistently. However, Victoria has supplementary coding standards to gather extra information for its own purposes beyond what is required at the national level. This includes a prefix on diagnosis codes that can, among other things, be used to identify conditions that arose during an episode of care. This prefix has been used for many years in Victoria, and will be utilised by the Victorian Department of Health to derive the condition-onset flag recently mandated for the NHMD.

The Commission obtained data from the Victorian Department of Health that uses the VAED condition-onset prefix, in combination with codes for specific infection organisms, to identify hospital-acquired cases of MRSA and vancomycin-resistant *enterococci* (VRE).[4] These data may slightly understate the number of infections for technical reasons associated with the coding of diagnoses.[5] To test this, the Commission compared public-hospital MRSA data from the VAED with that reported by VICNISS for type-2 hospitals. As expected, the MRSA infection rate was slightly lower using VAED data (table F.3).

The VAED data show that private hospitals had lower rates of hospital-acquired MRSA and VRE than public hospitals between 2005-06 and 2007-08 (figures F.1 and F.2). This pattern was also evident when the data were stratified by region and whether the patient spent time in an ICU (tables F.4 and F.5). Between 2005-06 and 2007-08, the infection rates for both MRSA and VRE in both public and private hospitals were greater in metropolitan hospitals than in rural hospitals. This may reflect the fact that metropolitan hospitals are more likely to treat complex cases with a greater risk of infection.

4 Cadwallader et al. (2001) also used data from hospital medical records to identify infections. They found that this approach was comparable to an infection-surveillance program in identifying SSIs following orthopaedic surgery in a WA teaching hospital in the late 1990s. More recently, Jackson, Michel, Roberts, Jorm and Wakefield (2009) have developed and validated a method for using data from hospital medical records that include a condition-onset flag to identify and classify hospital-acquired diagnoses (including hospital-acquired infections).

5 Data were derived from the VAED by identifying cases that had a C-prefix diagnosis for *Staphylococcus aureus* (ICD-10-AM code B95.6) or *Streptococcus* group D (B95.2), combined with a code for methicillin-resistant agent (Z06.32) or vancomycin-resistant agent (Z06.41). This might exclude some *Staphylococcus aureus* and *Streptococcus* group D infections that are identified by a combined 'infection site and organism code' specifying both (a) that there is an infection and (b) the organism is *Staphylococcus aureus* or *Streptococcus* group D.

Table F.3 **Comparison of VAED and VICNISS data for public-hospital MRSA infections**

	VAED[a]	*VICNISS*[b]
	2005–2008[c]	2004–2007[d]
No. of MRSA infections	101	82
Acute occupied bed days	1 736 866	1 226 952
Infection rate (per 10 000 acute occupied bed days)	0.58	0.67

[a] All public hospitals. MRSA infections were derived from the VAED by counting separations with diagnosis codes indicating a ‘C-prefix’ infection for B95.6 (*Staphylococcus aureus* as the cause of diseases classified to other chapters) and Z06.32 (methicillin-resistant agent) indicating the *Staphylococcus aureus* infection is methicillin resistant. [b] Public hospitals with fewer than 100 beds (VICNISS type-2 hospitals). [c] 1 July 2005 to 30 June 2008. [d] 1 May 2004 to 31 December 2007.

Source: Victorian Department of Health (unpublished VAED data); Victorian Department of Human Services (2008b).

Figure F.1 **Hospital-acquired MRSA infections in Victoria by sector, 2005–2008**[a]

[a] Excluding same-day separations. MRSA infections derived from the VAED only include separations that had a diagnosis code indicating a ‘C-prefix’ infection for B95.6 (*Staphylococcus aureus* as the cause of diseases classified to other chapters) and Z06.32 (methicillin-resistant agent) indicating the *Staphylococcus aureus* infection is methicillin resistant. This excludes *Staphylococcus aureus* infections identified by a combined ‘infection site and organism code’ specifying both (a) that there is an infection, and (b) the organism is *Staphylococcus aureus*. As a result, the number of MRSA infections may be underestimated.

Source: Victorian Department of Health (unpublished VAED data).

Figure F.2 **Hospital-acquired VRE infections in Victoria by sector, 2005–2008**[a]

[a] Excluding same-day separations. VRE infections derived from the VAED only include separations that had a diagnosis code indicating a ‘C-prefix’ infection for B95.2 (*Streptococcus* group D, as the cause of diseases classified to other chapters) and Z06.41 (vancomycin-resistant agent) indicating the *Enterococci* or Group D *Streptococci* infection is vancomycin resistant. This excludes Group D *Streptococcus* infections identified by a combined ‘infection site and organism code’ specifying both (a) that there is an infection, and (b) the organism is Group D *Streptococcus*. As a result, the number of VRE infections may be underestimated. There were no VRE infections in any rural private hospitals between 2005-06 and 2007-08.

Source: Victorian Department of Health (unpublished VAED data).

Table F.4 **Hospital-acquired MRSA infections in Victoria by region and ICU status, 2005-06 to 2007-08**

	Public		*Private*	
	Metropolitan	*Rural*	*Metropolitan*	*Rural*
No. of MRSA infections[a]	523	159	154	16
No. of ICU MRSA infections[b]	184	38	53	4
Acute occupied bed days[c]	7 979 017	3 262 177	3 907 202	592 865
Infection rate (per 10 000 acute occupied bed days)	0.66	0.49	0.39	0.27
ICU infection rate (per 10 000 acute occupied bed days)[d]	0.23	0.12	0.14	0.07

[a] Excluding same-day separations. MRSA infections derived from the VAED only include separations that had a diagnosis code indicating a ‘C-prefix’ infection for B95.6 (*Staphylococcus aureus* as the cause of diseases classified to other chapters) and Z06.32 (Methicillin-resistant agent) indicating the *Staphylococcus aureus* infection is methicillin resistant. This excludes *Staphylococcus aureus* infections identified by a combined ‘infection site and organism code’ specifying both (a) that there is an infection, and (b) the organism is *Staphylococcus aureus*. As a result, the number of MRSA infections may be underestimated. [b] This includes all patients who had hospital acquired MRSA infections and spent time in an ICU. [c] Excludes same-day separations. [d] Separations where the patient spent at least part of the episode in an ICU.

Source: Victorian Department of Health (unpublished VAED data).

Table F.5 **Hospital-acquired VRE infections in Victoria by region and ICU status, 2005-06 to 2007-08**

	Public		*Private*	
	Metropolitan	*Rural*	*Metropolitan*	*Rural*
No. of VRE infections[a]	155	8	12	–
No. of ICU VRE infections[b]	65	2	6	–
Acute occupied bed days[c]	7 979 017	3 262 177	3 907 202	592 865
Infection rate (per 10 000 acute occupied bed days)	0.19	0.02	0.03	–
ICU infection rate (per 10 000 acute occupied bed days)[d]	0.08	0.01	0.02	–

[a] Excluding same-day separations. VRE infections derived from the VAED only include separations that had a diagnosis code indicating a 'C-prefix' infection for B95.2 (*Streptococcus* group D, as the cause of diseases classified to other chapters) and Z06.41 (Vancomycin-resistant agent) indicating the *Enterococci* or Group D *Streptococci* infection is Vancomycin resistant. This excludes Group D *Streptococcus* infections identified by a combined 'infection site and organism code' specifying both (a) that there is an infection, and (b) the organism is Group D *Streptococcus*. As a result, the number of VRE infections may be underestimated. [b] This includes all patients who had hospital acquired VRE infections and spent time in an ICU. [c] Excludes same-day separations. [d] Separations where the patient spent at least part of the episode in an ICU unit. – Nil or rounded to zero.

Source: Victorian Department of Health (unpublished VAED data).

F.2 Queensland

There are two key sources of infections data in Queensland:

- Health Quality and Complaints Commission (HQCC)
- Centre for Healthcare Related Infection Surveillance and Prevention (CHRISP).

Health Quality and Complaints Commission

The HQCC was established in July 2006 as an independent body to monitor and improve the quality of health services in Queensland, and to manage health complaints. It introduced standards for healthcare providers in July 2007, with a staged approach to implementation (HQCC 2009). Acute hospitals and day surgeries were the first group required to report their compliance with the standards, and first reports were submitted to the HQCC in October 2007. The reporting of infections data began in March 2008.

Hospitals have the option to advise the HQCC that they are unable to provide data, although the HQCC advised the Productivity Commission that this has become less of a problem over time. The HQCC provided this study with unpublished data it had collected on SSIs and SAB BSIs for the six-month period from July to

December 2008. This period has the most complete set of infections data collected by the HQCC to date. The data show that average infection rates were lower in private hospitals (table F.6), but this result needs to be highly qualified. The HQCC cautioned that the data have a number of limitations because:

- the data are not risk adjusted
- the reporting arrangements are designed to enable healthcare providers to measure their own quality improvements over time, rather than compare themselves with other providers
- responsibility for data accuracy rests with reporting healthcare providers, as the HQCC does not have a systematic process to verify all submitted data
- different healthcare providers employ different sampling methods and sizes. These may not have been randomised or be representative of the provider's casemix. The HQCC has published guidance on appropriate sample sizes but these have not always been followed. In addition, the Productivity Commission understands that not all providers advise the HQCC about the methodology they use
- providers have employed a mix of medical chart, observational and administrative data audits to obtain the data
- differences in the casemix of individual providers may result in different infection rates. Casemix differences are particularly relevant when comparing the public and private sectors.

Table F.6 Selected hospital-acquired infections in Queensland, July–December 2008[a]

	Staphylococcus aureus bacteraemia			*Surgical-site infections*		
		Infection rate			*Infection rate*	
Sector	*Reporting hospitals*	*Average*[b]	*Inter-quartile range*[c]	*Reporting hospitals*	*Average*[b]	*Inter-quartile range*[c]
	no.	per 100 000 occupied bed days	per 100 000 occupied bed days	no.	per 100 surgical patients	per 100 surgical patients
Public	103	8.27	0–0.89	37	2.30	0–1.95
Private	53	6.03	0–5.55	36	0.26	0–0.86
Total	156	7.41	0–3.50	73	0.76	0–2.33

[a] Excludes same-day facilities. [b] Aggregated average calculated by dividing the total number of infections across all reporting hospitals by the total number of occupied bed days/surgical patients across all reporting hospitals. [c] The range between the first and third quartiles.

Source: HQCC (unpublished data).

Centre for Healthcare Related Infection Surveillance and Prevention

Twenty-four public hospitals in Queensland voluntarily submit surveillance data to CHRISP, which is part of the Queensland Department of Health. Private hospitals do not submit data to CHRISP.

The data aggregated and analysed by CHRISP include inpatient SSIs for 16 indicator procedures, healthcare-associated BSIs including SAB, and significant organisms including MRSA and *Clostridium difficile* (CHRISP 2009; Queensland Health, sub. 27). SAB data are collected for inpatients and non-inpatients, and can be stratified into three hospital types based on the services that they provide. This is a new classification system based on work undertaken by CHRISP that showed a correlation between BSIs and particular services (Tong et al. 2009).

Definitions used by CHRISP are based on the Health Care Associated Infection Surveillance Definitions from the Australian Infection Control Association (AICA) and the ACSQHC. The risk-adjustment method used for SSIs is based on that developed in the United States by the US National Healthcare Safety Network (NHSN) (formerly the US National Nosocomial Infections Surveillance — NNIS). Recent CHRISP data for SSIs are shown in table F.7.

CHRISP provides feedback to individual hospitals in six-monthly reports that compare the hospital's infection rates with statewide control limits. The control limits are based on statewide averages for the relevant hospital type, and the methodology is based on funnel plots (Spiegelhalter 2004).

Table F.7 **SSI rates for Queensland public hospitals by surgical procedure, 2004–2008[a]**

	Risk category[b]					
Surgical procedure	*0*		*1*		*2*	
Total hip replacement	0.71	(0.45–1.07)	0.97	(0.58–1.51)	2.80	(1.35–5.09)
Revision total hip replacement	3.10	(1.49–5.62)	3.36	(1.62–6.08)	8.33	(2.29–19.98)
Total knee replacement	0.68	(0.46–0.97)	0.91	(0.6–1.33)	0.61	(0.12–1.77)
Revision total knee replacement	1.52	(0.31–4.38)	2.07	(0.56–5.22)	5.26	(0.6–17.74)
Femoro-popliteal bypass	7.14	(2.91–14.16)	5.88	(3.88–8.50)	8.43	(4.68–13.75)
Elective lower segment caesarean section	0.45	(0.34–0.58)	0.99	(0.71–1.35)	3.61	(0.73–10.2)
Emergency lower segment caesarean section	0.95	(0.80–1.12)	1.38	(1.09–1.73)	1.18	(0.13–4.21)
Mastectomy (simple)	0.69	(0.19–1.76)	1.59	(0.52–3.68)	–	..
Mastectomy (radical)	0.31	(0.00–1.70)	0.60	(0.01–3.29)	–	..
Total abdominal hysterectomy	0.96	(0.61–1.42)	3.04	(2.08–4.29)	4.88	(1.33–12.02)
Cardiac valve replacement	1.05	(0.12–3.75)	3.03	(0.34–10.52)	–	..
CABG with graft site (sternal wound)[c]	1.27	(0.66–2.21)	1.46	(1.15–1.83)	2.82	(2.04–3.79)
CABG with graft site (graft wound)[c]	1.65	(1.36–2.00)	3.40	(2.69–4.24)	–	..
CABG with no separate graft site[c]	0.86	(0.17–2.51)	1.54	(0.17–5.44)	–	..

[a] SSI rates are expressed in terms of infections per 100 procedures. [b] Risk categories are based on the NHSN/NNIS risk index for SSIs (detailed in box 6.1). Numbers in parentheses are 95 per cent confidence intervals. [c] CABG refers to coronary artery bypass graft. – Nil or rounded to zero. .. Not applicable.

Source: Queensland Department of Health (unpublished data).

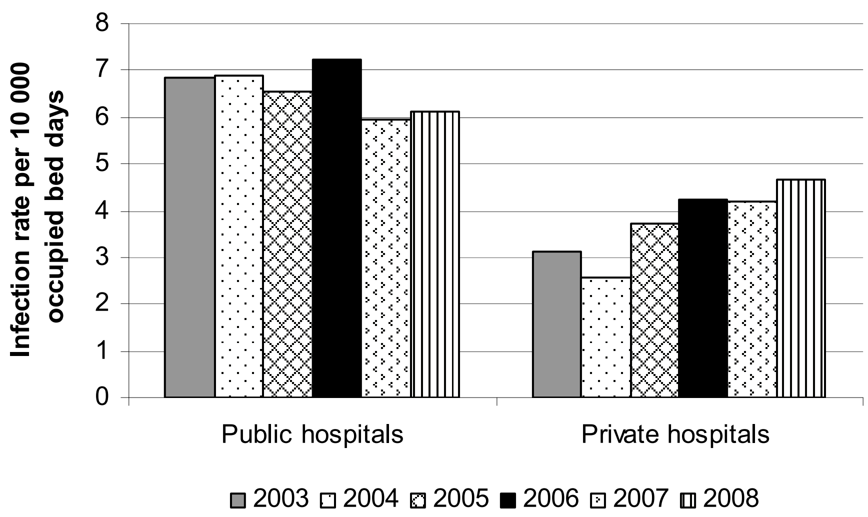
F.3 South Australia

The Infection Control Service (ICS) within the SA Department of Health collects data on BSIs, multi-resistant organisms (MROs) and *Clostridium difficile*. A wide range of MROs are reported, including MRSA and extended spectrum beta-lactamase producing gram negatives.[6] South Australia is the only Australian state that conducts statewide surveillance of multiresistant gram-negative bacteria infections (Christiansen et al. 2008). In many cases, the SA infections data can be stratified into different risk groups, such as ICU/non-ICU, specialty and inpatient/non-inpatient (SA Department of Health 2005a, 2005b, 2009a).

Reporting is voluntary and there are currently 17 participating hospitals (eight public and nine private). The Commission understands that there is a high participation rate among metropolitan hospitals, and that they account for the majority of reporting establishments. Participating hospitals receive regular reports from the ICS with statewide aggregates and the participant's data. The ICS also releases public reports, but these do not disaggregate data between public and private hospitals.

The Commission obtained ICS data for eight public hospitals and eight private hospitals, disaggregated by sector. These data show that from 2003 to 2008, rates of hospital-acquired BSI were lower in private hospitals than in public hospitals (figure F.3).

Figure F.3 **Hospital-acquired BSIs in South Australia by sector, 2003–2008**



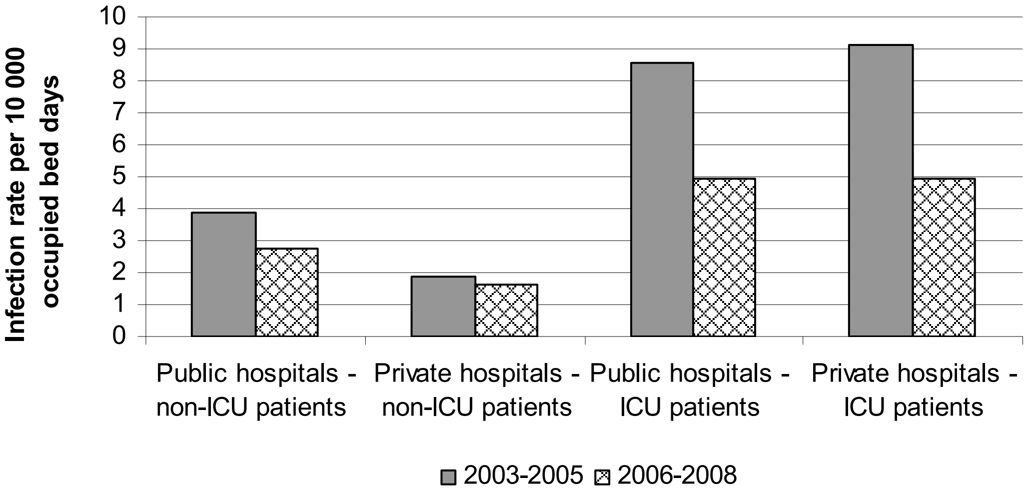
Source: SA Department of Health (unpublished data).

---

6 Targeted MROs are MRSA, VRE, *Staphylococcus aureus* with reduced susceptibility to vancomycin (VISA), *Staphylococcus aureus* resistant to vancomycin (VRSA), multi-resistant *Pseudomonas aeruginosa*, extended spectrum beta-lactamase producers (ESBL, including gram-negative organisms, carbapenem-resistant *Enterobacteriaceae* and *Acinetobacter* species. MRO definitions are based on those developed by the AICA (SA Department of Health 2005a).

Likewise, MRSA infection rates for patients who were not admitted to an ICU were lower in private hospitals (figure F.4). MRSA infection rates for patients admitted to an ICU were marginally higher in private hospitals in 2003–05 but were similar in both public and private hospitals over the period 2006–08. However, caution should be exercised in interpreting infection rates for patients admitted to an ICU, as the small number of affected patients means that one additional case can cause a significant change in infection rates.

Figure F.4 **Hospital-acquired MRSA infections in South Australia by sector and ICU status, 2003–2008**



Source: SA Department of Health (unpublished data).

F.4 Western Australia

In 2005, public and private hospitals in Western Australia began reporting infection rates on a voluntary basis to the Healthcare Infection Surveillance Western Australia (HISWA) program. The HISWA program is managed by the Health Care Associated Infection Unit (HCAIU) within the WA Department of Health. Reporting of some of the HISWA infection indicators was made mandatory in 2007 for public hospitals and private hospitals that provide services for public patients. Private hospitals treating only private patients continue to report data voluntarily.

The HISWA program currently collects data on six different infection rates:

1. healthcare-associated MRSA
2. SSIs following elective hip and knee arthroplasty (surgical joint repair)
3. healthcare-associated SAB

4. central-line-associated BSIs in an ICU
5. central-line-associated BSIs in haematology/oncology/outpatient intravenous therapy units
6. haemodialysis-associated BSIs from access devices.

All but one of these indicators is, or will soon be, mandatory for public hospitals and private hospitals that provide services for public patients (WA Department of Health 2009a). The one exception is central-line-associated BSIs in haematology/oncology/outpatient intravenous therapy units. Data on healthcare-associated *Clostridium difficile* will be collected from January 2010.

The Australian Health Insurance Association (AHIA) claimed that the WA mandatory reporting regime had helped to keep MRSA infection rates relatively low:

> It is the strongly held view of the AHIA that it is not coincidental that the lowest rate of MRSA infection in Australia is in Western Australia, which is the only state or territory where notification of MRSA infection is mandatory. (sub. 18, p. 6)

The HISWA indicators are based on nationally- and internationally-recommended surveillance definitions. Results are collated and analysed by the HCAIU. Individual hospital and aggregate reports are generated quarterly and more detailed reports are published annually. Infection rates are risk adjusted where possible to better reflect differences in clinical casemix between participating hospitals (WA Department of Health 2008). Nevertheless, the HCAIU stressed that:

> … the prime purpose of the HISWA surveillance program is to support internal improvement, rather than performance comparison. This implies an emphasis on collecting data over time to monitor progress, and internal validity within a facility. (sub. 38, p. 3)

The published HCAIU reports have only a limited amount of information about the relative performance of public and private hospitals. That information suggests that, after using the NHSN/NNIS risk index to stratify data by risk groups, private hospitals had lower SSI rates for hip and knee arthroplasty than public hospitals during the period 2002–08 (WA Department of Health 2009b). The difference was considered to be statistically significant, but the HCAIU cautioned that the NHSN/NNIS risk index may not control for all risk differences between hospitals:

> The reasons behind this variation may relate to a variety of practices and procedures that are in place at these hospitals; however there is also likely to be differences in the prevalence of risk factors for SSI such as smoking, obesity, diabetes and other co-morbidities between institutions that are not incorporated into the risk adjustment. Comparison therefore must be made carefully, and many factors will not necessarily be modifiable by the hospitals involved. (WA Department of Health 2009b, p. 17)

The published data also suggest that WA private hospitals tend to have lower rates of hospital-acquired MRSA infections than public hospitals.[7] However, the difference may be largely due to private hospitals tending to have lower-risk procedures, treatments and patients.

The Commission obtained unpublished data from the HCAIU on SAB BSIs, MRSA, and SSIs following elective hip and knee arthroplasty. The data show that private hospitals had lower rates of hospital-acquired MRSA infections than public hospitals from 2006 to 2008 (table F.8). However, this difference was only statistically significant in 2007. Furthermore, the HCAIU cautioned that:

> This [MRSA infection] rate will depend on both the risk of a healthcare-associated infection (which varies according to casemix as well as aspects of the quality of care provided); and the risk of that infection being due to MRSA (which reflects endemic MRSA rates in the patient population and the risk of acquiring MRSA in the hospital). Comparison must therefore be made considering differences in case mix and MRSA rates in the admitted patient population before associating differences in rates to variation in the quality of care provided. Public hospitals may have both a more complex patient case mix with an inherently higher risk of developing an HAI [hospital-acquired infection] and a higher prevalence of MRSA carriage on admission to hospital. (sub. 38, p. 5)

Table F.8 **Hospital-acquired MRSA in Western Australia by sector, 2006–2008[a]**

	No. of events	*Occupied bed days*	*Infection rate[b]*
2006			
Public	100	836 463	1.20 (0.98–1.46)
Private	40	482 633	0.83 (0.61–1.13)
Total	140	1 319 096	1.06 (0.90–1.25)
2007			
Public	80	875 396	0.91 (0.73–1.14)
Private	23	508 023	0.45 (0.30–0.68)
Total	103	1 383 419	0.74 (0.61–0.90)
2008			
Public	115	895 890	1.28 (1.07–1.54)
Private	43	521 618	0.82 (0.61–1.11)
Total	158	1 417 508	1.11 (0.95–1.30)

[a] Inpatient events only. [b] Infections per 10 000 occupied bed days. Numbers in parentheses are 95 per cent confidence intervals.

7 In 2007-08, reporting private hospitals had an MRSA infection rate of 0.68 per 10 000 bed days (95 per cent confidence interval of 0.48–0.95). This was compared to four (public) area health services, which had rates that ranged from 0.19 (0.00–1.19) to 1.26 (0.92–1.71). The only area health service with a lower rate than private hospitals was the Child and Adolescent Health Service, which reported just one MRSA case in 2007-08.

Source: HCAIU (unpublished data).

The unpublished data show that private hospitals also had lower rates of hospital-acquired SAB BSIs than public hospitals (table F.9). However, this difference was only statistically significant in 2008. Furthermore, the HCAIU cautioned that:

> The risk of an individual patient acquiring a *Staphylococcus aureus* bacteraemia is related to their underlying medical condition, complexity of care and the invasive procedures they are subject to, as well as the quality of care provided. (sub. 38, p. 5)

Table F.9 **Hospital-acquired SAB BSIs in Western Australia by sector, 2007–2008**[a]

	No. of events	*Occupied bed days*	*Infection rate*[b]
2007			
Public	28	875 396	0.32 (0.22–0.47)
Private	7	508 023	0.14 (0.06–0.29)
Total	35	1 383 419	0.25 (0.18–0.35)
2008			
Public	113	895 890	1.26 (1.05–1.52)
Private	35	521 618	0.67 (0.48–0.94)
Total	148	1 417 508	1.04 (0.89–1.23)

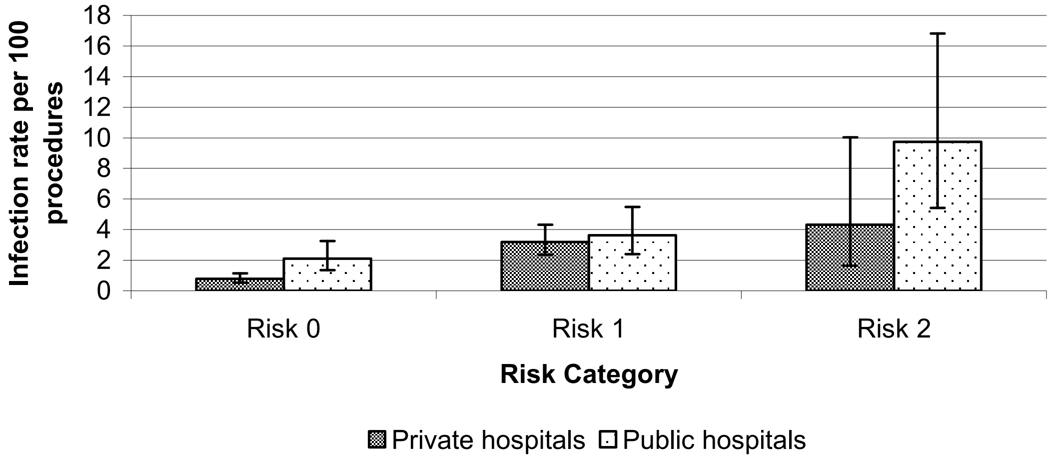
[a] Inpatient events only. [b] Infections per 10 000 occupied bed days. Numbers in parentheses are 95 per cent confidence intervals.

Source: HCAIU (unpublished data).

The unpublished data suggest that public hospitals had higher SSI rates across all risk categories for both hip and knee procedures (figures F.5 and F.6). However, this difference was only statistically significant for hip procedures in risk category zero. Furthermore, the HCAIU cautioned that while WA data on SSI rates are risk adjusted using the NHSN/NNIS methodology, this does not control for all risk factors:

> SSI rates that are risk-adjusted using NHSN stratification do *not* account for systematic differences in patient, operator and unit characteristics that raise the inherent or underlying SSI risk of public hospitals. They are subject to bias, and while useful, must be interpreted with this understanding. (sub. 38, p. 4)

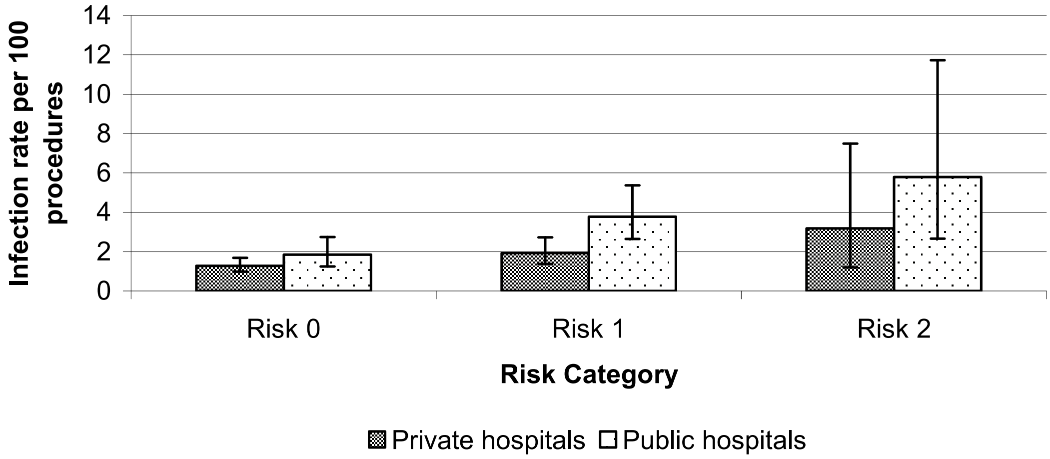
Figure F.5 Hip SSIs in Western Australia by risk category and sector, 2006–2008[a]



[a] Risk categories are based on the NNIS risk index. The vertical lines for each risk category indicate the 95 per cent confidence interval.

Source: HCAIU (unpublished data).

Figure F.6 Knee SSIs in Western Australia by risk category and sector, 2006–2008[a]



[a] Risk categories are based on the NNIS risk index. The vertical lines for each risk category indicate the 95 per cent confidence interval.

Source: HCAIU (unpublished data).

F.5 Tasmania

In 2008, the Tasmanian Infection Prevention and Control Unit (TIPCU) was established by the Department of Health and Human Services to manage a surveillance program for hospital-acquired infections. Four infection rates are currently monitored — SAB BSIs, MRSA, *Clostridium difficile* and VRE (TIPCU 2009). The definitions used for these indicators are based on those recommended by the ACSQHC.

VRE has been a notifiable disease in Tasmania since 2000, and SAB BSIs since December 2008. Thus, VRE and SAB reporting is mandatory for both public and private hospitals. Private hospitals have volunteered to also report the MRSA and *Clostridium difficile* indicators along with public hospitals. The Commission understands that data are collected from four public hospitals and five private hospitals.

TIPCU provides confidential reports back to all reporting hospitals. Its first public report was released in March 2009. To date, only data for public hospitals have been published (summarised in table F.10). On the basis of the published data, TIPCU (2009) concluded that Tasmanian acute public hospitals have similar infection rates for MRSA and SAB BSIs as public hospitals in other states. The rate of *Clostridium difficile* in Tasmanian public hospitals was considered to be slightly higher than that reported in other states, but there is limited data with which to make comparisons.

Table F.10 **Rate of hospital-acquired infections in Tasmanian public hospitals by organism, 2005–2008[a]**

	2006	*2007*	*2008*
Staphylococcus aureus bacteraemia (SAB)[b]	0.92	1.11	1.07
SAB caused by methicillin-resistant *Staphylococcus aureus* (MRSA)[b]	0.14	0.04	0.21
Clostridium difficile[c]	2.20	1.80	3.20

a Infection rates are expressed as infections per 10 000 occupied bed days. **b** Based on six months of data for 2008. **c** Based on six months of data for both 2006 and 2008.

Source: TIPCU (2009).

The Commission requested comparative infections data for public and private hospitals but the Tasmanian Department of Health and Human Services was unable to provide such information in time for this report.

G Referee reports on modelling

G.1 Report from Adjunct Professor Tim Coelli

This study of hospital performance in Australia sets a new benchmark in terms of the sample coverage and the range of input, output and control variables included in the econometric model. The Productivity Commission team has worked hard at producing the best empirical model possible, in the face of challenging time and data constraints. However, no empirical study is perfect, so in my brief discussion below I provide my assessment of the analysis, pointing out what is to be commended and what can perhaps be improved.

Data sample: The sample size of 508 is more than sufficient to allow the Productivity Commission (PC) to estimate an econometric model that involves a flexible functional form and a number of important input, output and control variables. The main concern with the sample, as it stands, relates to a high non-response rate on the part of not-for-profit hospitals. Hence the private hospitals in the sample are mostly for-profit hospitals, and the results obtained should be viewed in this light. However, my experience with not-for-profit hospitals (mostly run by church groups) is that they tend to put extra resources into non-medical services and hence I do not expect them to normally have much influence on the position of the best-practice frontier. Hence, I expect that their low sample representation is unlikely to significantly affect the efficiency scores of the remaining hospitals in the sample.

Frontier methodology: There are two frontier estimation methods that are commonly used in the literature: data envelopment analysis (DEA) and stochastic frontier analysis (SFA). DEA is a linear programming method that has the advantage that no particular functional form needs to be specified. However, SFA is an econometric method that is less susceptible to the effects of data noise and outliers and which also allows one to easily incorporate control variables that involve categorical and ratio data. Hence the choice of SFA is appropriate for this study.

Functional form: The translog function form is a flexible second-order functional form that can accommodate a range of scale and substitution possibilities, and hence is a good choice in my assessment.

Output measures: The output measures involve a number of categories of admitted and non-admitted separations, with the former casemix-adjusted. The level of detail is substantially better than many past studies of hospital efficiency. The authors emphasize the point that these are measures of intermediate outputs rather than incremental health benefits derived from the services. However, this is standard practice in this literature, given the very substantial challenges that would be involved in attempting to derive these latter output measures.

Input measures: The input measures include three categories of staff members (nursing, diagnostic and other), three monetary measures of non-staff variable inputs (drugs, medical and surgical supplies and other) along with the number of beds. This group of input measures is better than that used in the majority of past studies, but can still be improved upon (given access to better data). In particular, the beds measure treats an intensive care bed no differently to a standard bed, and the staff measures exclude doctors. These issues could introduce some biases in efficiency estimates if the casemix weights (used to define the output measures) include allowances for the extra capital costs associated with complex cases, and if there are differences among hospitals in the degree to which doctors versus nurses undertake certain “grey area” tasks.

Quality measures: Quality issues have been often overlooked in past studies of health sector efficiency. The PC is to be commended for their efforts in this regard. The inclusion of a mortality rate measure that is adjusted for patient risk characteristics is not a perfect measure, but should go a long way to capturing any notable variations in the effects of service quality upon efficiency potentials.

Control measures: The PC has considered a wide range of exogenous control measures that could potentially be affecting efficiency potentials, including network membership, accident and emergency rates, and so on. These measures help the analyst to avoid labelling a hospital as being “inefficient” when they may be using more resources per unit output because they face different operating conditions relative to other members of the sample.

Finally, I should emphasize a number of points. First, most if not all of the comments made above are also mentioned in the main report. Second, time and data constraints have clearly placed limits on the empirical analysis in this report. Third, I look forward to seeing what is produced in the supplementary report that is due to be released in March 2010, which will involve data from additional years and will also involve the investigation of some alternative models and a more detailed investigation of the effects of scale on hospital performance.

G.2 Report from Professor Jim Butler

The estimation of hospital production functions and hospital cost functions is a complicated exercise. These complications arise not just because hospitals are multi-product organisations, but because of the large range and diversity of the outputs they produce. The ‘treated patient’ is not a homogeneous unit of output but differs according to the illness or illnesses with which they present, the severity of those illnesses, the range of treatments available and which are selected, and patient characteristics such as age, sex and frailty. The econometric modeller then faces a quandary. Working with a sufficiently large number of output categories to minimise heterogeneity within those categories will lead to a large number of parameters to be estimated, especially if the specification involves a flexible functional form. However, the pursuit of parameter parsimony, which requires a smaller number of output categories, introduces more heterogeneity into the output categories.

In addition to this type of conceptual difficulty, there are difficulties arising out of the institutional arrangements for the provision of hospital services in Australia (e.g. the inclusion of medical service costs in hospital costs for public hospitals but not private hospitals), the lack of a ‘pure’ separation between type of hospital ownership and the funding status of patients, and the paucity of data on capital costs.

Notwithstanding these difficulties, and the tight timelines within which the Commission was working, it has produced a high quality and interesting piece of work comparing technical efficiency in public and private hospitals using data on 508 hospitals for 2006-07. Using stochastic frontier analysis and several functional forms for a production function, the analysis concludes that the technical efficiency of public hospitals and private hospitals is similar. Across all hospital size groupings, public hospitals have a mean efficiency score of 0.797 and private hospitals 0.750 suggesting slightly superior performance by public hospitals (table 8.5 — there was virtually no difference between the scores for for-profit and not-for-profit private hospitals). Given the difficulties associated with empirical work in this area mentioned above (and that list is not exhaustive), the description of these mean scores for public and private hospitals as ‘similar’ is a judicious call of the results. The only size grouping where a more marked difference between the scores for public and private hospitals emerges is the ‘small and very small’ hospitals category with mean public and private hospital scores of 0.788 and 0.641

respectively (table 8.5). But with these results and others, one should bear in mind the possibility of self-selection bias in the private hospital sample of 122 hospitals as participation in the study by private hospitals was voluntary. The Report does specifically mention this limitation.

An innovative aspect of this study is its distinction between public hospitals and public contract hospitals. The latter are privately owned institutions whose caseload comprises a large proportion of public patients treated under contract from government (on average, public patients comprise 77.9% of the caseload of public hospitals cf. 77.4% for public contract hospitals – see Table 8.2). There is virtually no difference in the technical efficiency scores between these two types of institution (0.797 for public hospitals, 0.800 for public contract hospitals — table 8.5). While the sample size for public contract hospitals is not large (n=18), this result is of some interest.

A result which has perhaps been somewhat underplayed is the absence of any significant effect of risk-adjusted mortality ratios in the production model. The Commission has constructed a predicted value of the mortality rate (proportion of patients discharged dead) for each hospital using a Tobit regression with various factors exogenous to the hospital as regressors. These predicted values are then used to construct a risk-adjusted mortality ratio for each hospital which is used in the production function to investigate possible quantity/quality trade-offs in hospital production. The absence of a statistically significant effect here is potentially a policy-significant result — there is no evidence that hospitals in this study attain higher output levels or improve technical efficiency by allowing quality to deteriorate.

In concluding, two important limitations of this study should be noted. First, it is based upon data for only one year. Replication of the analyses using data from other years may instil more confidence in the results. Second, the study investigates only technical efficiency and not cost efficiency. As the Commission notes, a hospital's performance with respect to technical efficiency may differ from its performance with respect to cost efficiency, so results on the latter would provide a more complete picture of hospital performance. The Report indicates that both of these limitations will be addressed in further analyses, the results of which will be available in a supplementary report in March 2010. If those analyses are conducted to the same standard as the analyses presented in this Report, they will undoubtedly provide a very useful addition to the stock of knowledge in this field.

References

ABS (Australian Bureau of Statistics) 2005, *Australian Standard Geographical Classification (ASGC)*, Cat. no. 1216.0, Canberra.

—— 2007, *Private Hospitals*, Cat. no. 4390.0, Canberra.

—— 2008a, *An Introduction to Socio-Economic Indices for Areas (SEIFA), 2006*, Information paper, Cat. no. 2039.0, Canberra.

—— 2008b, *Australian Demographic Statistics*, Cat. no. 3101.0, Canberra.

—— 2008c, *Average Weekly Earnings*, *Australia*, Cat no. 6302.0, Canberra.

—— 2008d, *Consumer Price Index*, *Australia*, Cat. no. 6401.0, Canberra.

—— 2008e, *Labour Price Index*, *Australia*, Cat. no. 6345.0, Canberra.

—— 2008f (and previous issues), *Private Hospitals*, Cat. no. 4390.0, Canberra.

—— 2008g, *Socio‑Economic Indexes for Areas (SEIFA): Technical Paper 2006*, Cat. no. 2039.0.55.001, Canberra.

—— 2009a, *Australian National Accounts: National Income, Expenditure and Product*, Cat. no. 5206.0, Canberra.

—— 2009b, *National Health Survey*, *Australia*, Cat. no. 4364.0, Canberra.

Access Economics 2009, *Impact of Means Testing the PHI Rebate and Changing MLS Parameters*, Report for Catholic Health Australia, Canberra www.accesseconomics.com.au/publicationsreports/getreport.php?report=203&id=259 (accessed 16 September 2009).

ACEM (Australasian College for Emergency Medicine) 2000, 'Policy on the Australian Triage Scale', *Policy P06*, www.acem.org.au/media/policies_and_guidelines/P06_Aust_Triage_Scale_-_Nov_2000.pdf (accessed 29 July 2009).

ACHR (Australian Centre for Health Research) 2008, *Measuring Quality in Private Hospitals*, Report by the National Health and Medical Research Council Centre of Research Excellence in Patient Safety, Department of Epidemiology and Preventive Medicine, Monash University, Melbourne.

ACHS (Australian Council on Healthcare Standards) 2007, *Australasian Clinical Indicator Report 1998–2006: Determining the Potential to Improve Quality of Care*, 8th edn, Sydney.

—— 2008, *Australasian Clinical Indicator Report 2001–2007: Determining the Potential to Improve Quality of Care*, 9th edn, Sydney.

ACSQHC (Australian Commission on Safety and Quality in Health Care) 2008, *Windows into Safety and Quality in Health Care 2008*, Sydney.

ACT Revenue Office 2009a, *Exempt Wages and Payments*, Canberra, www.revenue.act.gov.au/payroll_tax#Exempt_Wages_and_Payments (accessed 6 March 2009).

—— 2009b, *Payroll Tax Thresholds and Rate,* Canberra, www.revenue.act.gov.au/payroll_tax#Payroll_Tax_Thresholds_and_Rate (accessed 6 March 2009).

Aigner, D.J., Lovell, C.A. Knox, and Schmidt, P. 1977, 'Formulation and estimation of stochastic frontier production function models', *Journal of Econometrics*, vol. 6, no. 1, pp. 21–37.

AHMAC (Australian Health Ministers' Advisory Council) 2006, *Aboriginal and Torres Strait Islander Health Performance Framework Report 2006,* Canberra.

AIHW (Australian Institute of Health and Welfare) 2004, *Australian Hospital Statistics 2002-03*, Health Services Series no. 22, Cat. no. HSE 32, Canberra.

—— 2005, *Australian Hospital Statistics 2003-04*, Health Services Series no. 23, Cat. no. HSE 37, Canberra.

—— 2006, *Australian Hospital Statistics 2004-05*, Health Services Series no. 26, Cat. no. HSE 41, Canberra.

—— 2007a, *Australian Hospital Statistics 2005-06*, Health Services Series no. 30, Cat. no. HSE 50, Canberra.

—— 2007b, *The AIHW National Mortality Database Documentation*, www.aihw.gov.au/mortality/data_dictionary_latest.pdf (accessed 25 August 2009).

—— 2008a, *A Set of Performance Indicators Across the Health and Aged Care System*, Canberra.

—— 2008b, *Australian Hospital Statistics 2006-07*, Health Services Series no. 31, Cat. no. HSE 55, Canberra.

—— 2008c, *Australia's Health 2008*, Cat. no. AUS 99, Canberra.

—— 2008d, (and previous issues), *Australia's Mothers and Babies 2006*, Cat. no. PER 46, Sydney.

—— 2008e, *Elective Surgery in Australia: New Measures of Access*, Cat. no. HSE 57, Canberra.

—— 2009a, *Australian Hospital Statistics 2007-08*, Health Services Series no. 33, Cat. no. HSE 71, Canberra.

—— 2009b, *Australian Hospital Statistics 2007-08*, *supplementary tables: Australian Refined Diagnosis Related Groups for admitted patients*, www.aihw.gov.au/publications/hse/hse-71-10776/hse-71-10776-xx12.xls (accessed 5 November 2009).

—— 2009c, *Health Expenditure Australia 2007-08*, Health and Welfare Expenditure Series no. 37, Cat. no. HWE 46, Canberra.

—— 2009d, *Health Sector Reporting Relationships for Health Committees*, Canberra.

—— 2009e, *Privacy of data*. www.aihw.gov.au/dataonline/privacy_of_data.cfm, Canberra.

—— 2009f, *Sources of Funds for Admitted Patients in Australian Hospitals, 2005-06*, Health and Welfare Expenditure Series, no. 39. Cat. no. HWE 44. Canberra.

—— 2009g, *Towards National Indicators of Safety and Quality in Health Care*, Cat. no. HSE 75, Canberra.

Al Shammari, M. 1999, 'A multi-criteria data envelopment analysis model for measuring the productive efficiency of hospitals', *International Journal of Operations and Production Management*, vol. 19, no. 9, pp. 879–90.

AMA (Australian Medical Association) Victoria 2001, *Private hospital access fears confirmed*, Media release, Melbourne, 7 December.

Arocena, P. and Garcia-Prado, A. 2007, 'Accounting for quality in the measurement of hospital performance: evidence from Costa Rica', *Health Economics*, vol. 16, pp. 667-85.

ASX (Australian Securities Exchange) 2009, *Health Care Sector Profile*, www.asx.com.au/research/pdf/health_care_sector_factsheet.pdf (accessed 29 July 2009).

ATO (Australian Tax Office) 2007a, *Fringe Benefits Tax — Tax Basics for Non-Profit Organisations,* Canberra, www.ato.gov.au/nonprofit/content.asp?doc=/content/33618.htm&page=10&H10=&pc=001/004/012/006/001&mnu=44780&mfp=001&st=&cy=1 (accessed 4 March 2009).

Auditor-General for Western Australia 2007, *First Do No Harm: Reducing Adverse Events in Public Hospitals*, Report 10, Perth.

Australian Government 2009, *Budget Measures 2009-10,* Budget Paper No. 2, Canberra.

Australian Senate Community Affairs Legislation Committee 2009, fairer private health insurance incentives bill 2009 and two related bills, www.aph.gov.au/senate/committee/clac_ctte/fairer_private_health_09/report/report.pdf (accessed 16 September 2009).

Baghurst, A., Place, M. and Posnett, J.W. 1999, 'Dynamics of bed use in accommodating emergency admission: stochastic simulation model', *British Medical Journal*, vol. 319, pp. 155–58.

Banker, R.D., Conrad, R.F. and Strauss, R.P. 1986, 'A comparative application of data envelopment analysis and translog methods: an illustrative study of hospital production', *Management Science*, vol. 39, no. 10, pp. 1265–73.

Bedard, J.C. and Wen, K.W. 1990, 'A comparison of the efficiency effects of prospective Reimbursement System', *Research in Governmental and Non-profit Accounting*, vol. 6, pp. 63–82.

Ben-Tovim, D., Woodman, R., Harrison, J.E., Pointer, S., Hakendorf, P. and Henley, G. 2009, *Measuring and Reporting Mortality in Hospital Patients*, AIHW, Cat. no. HSE 69, Canberra.

Biørn, E., Hagen, T.P, Iversen, T., and Magnussen, J. 2003, 'The effect of activity based financing on hospital efficiency: a panel data analysis of DEA efficiency scores 1992-2000', *Health Care Management Science*, vol. 6, pp. 271-83.

Borden, J.P. 1988, 'An assessment of the impact of diagnosis-related group (DRG)-based reimbursement on the technical efficiency of New Jersey hospitals using data envelopment analysis', *Journal of Accounting and Public Policy*, vol. 7, pp. 77–96.

Breyer, F. 1987, 'The specification of a hospital cost function – a comment on the recent literature', *Journal of Health Economics*, vol. 6, pp. 147–57.

Bridges, J., Haas, M. and Mazevska, D. 1999, *A Qualitative Insight into Rural Casemix Education,* Centre for Health Economics Research and Evaluation Project Report 10, Melbourne.

Brown, H.S. 2003, 'Managed care and technical efficiency', *Health Economics*, vol. 12, pp. 149–58.

Bull, A., McGechie, D., Richards, M, Russo, P. and Worth, L. 2008, 'Surgical Site Infection', in Cruickshank, M. and Ferguson, J. (eds), *Reducing Harm to Patients from Health Care Associated Infection: The Role of Surveillance*, Australian Commission on Safety and Quality in Health Care, Sydney, pp. 91–107.

BUPA Australia 2004, *Submission to the Productivity Commission's study into Impacts of Advances in Medical Technology in Australia*, Sydney.

Burgess, J.F. and Wilson, P.W. 1995, ‘Decomposing hospital productivity changes, 1985–1988: a nonparametric malmquist approach’, *Journal of Productivity Analysis*, vol. 6, pp. 343–63.

—— 1998, ‘Variation of inefficiency in US hospitals’, *Canadian Journal of Operational Research and Information*, vol. 36, pp. 84–102.

Butler, 1988a, ‘Hospital costs and information theory case mix indexes: results for Queensland’, *Prometheus*, vol. 6, no. 2, pp. 327–50.

—— 1988b, ‘Issues in hospital funding’, in CEDA (Committee for Economic Development of Australia), *The Economics of Health Care*, APAIS, Canberra, pp. 87–116.

—— 1995, *Hospital Cost Analysis*, Kluwer Academic, Dordrecht.

Cadwallader, H., Toohey, M., Linton, S., Dyson, A. and Riley, T. 2001, ‘A comparison of two methods for identifying surgical site infections following orthopaedic surgery’, *Journal of Hospital Infection*, vol. 48, pp. 261–66.

Catholic Health Australia 2009a, *Catholic Health Australia Clinical Placements Survey — Interim Results, Canberra*.

—— 2009b, *The Sector*. www.cha.org.au/site.php?id=24 (accessed 25 September 2009).

CHRISP (Centre for Healthcare Related Infection Surveillance and Prevention) 2003, *CHRISP User Manual*, Queensland Department of Health, Brisbane.

—— 2009, *CHRISP Surveillance Manual*, 3rd edn, Queensland Department of Health, Brisbane.

Chambers, D.C., 2009, Letter in response to ‘Adverse outcomes of labour in public and private hospitals in Australia’, *Medical Journal of Australia*, vol. 191, no. 10, pp. 578–79.

Charlson, M.E., Pompei, P., Ales K.L. and MacKenzie, C.R. 1987, ‘A new method of classifying prognostic comorbidity in longitudinal studies: development and validation’, *Journal of Chronic Diseases*, vol. 40, no. 5, pp. 373–83.

Charnes, A., Cooper, WW, and Rhodes, E. 1978, ‘Measuring the efficiency of decision-making units’, *European Journal of Operational Research*, vol. 2, pp. 429–44.

Chen, S. N. 2006, ‘Productivity changes in Taiwanese hospitals and the national health insurance’, *Service Industries Journal*, vol. 26 no. 4, pp. 459–77.

Christiansen, K., Coombs, G., Ferguson, J., Iredell, J., Marshall, C., Nimmo, G., Turnidge, J., Van Gessel, H. and Wilkinson, I. 2008, ‘Multiresistant organisms’, in Cruickshank, M. and Ferguson, J. (eds), *Reducing Harm to Patients From*

Health Care Associated Infection: The Role of Surveillance, Australian Commission on Safety and Quality in Health Care, Sydney, pp. 129–69.

Christiansen, K., Tibbett, P., Beresford, W., Pearman, J., Lee, R., Coombs, G., Kay, I., O'Brien, F., Palladino, S., Douglas, C., Montgomery, P., Orrell, T., Peterson, A., Kosaras, F., Flexman, J., Heath, C. and McCullough, C. 2004, 'Eradication of a large outbreak of a single strain of vanB vancomycin-resistant enterococcus faecium at a major Australian teaching hospital', *Infection Control and Hospital Epidemiology*, vol. 25, no. 5, pp. 384–90.

Chua, C.L., Palangkaraya, A. and Yong, J. 2008, *A Two-Stage Estimation of Hospital Performance Using Mortality Outcome Measures: An Application Using Victorian Hospital Data*, Melbourne Institute Working paper no. 10/08, The University of Melbourne.

—— 2009, *Hospital Competition, Technical Efficiency and Quality*, Melbourne Institute Working paper no. 16/09, The University of Melbourne.

Clements, A., Tong, E., Morton, A. and Whitby, M. 2007, 'Risk stratification for surgical site infections in Australia: evaluation of the US National Nosocomial Infection Surveillance risk index', *Journal of Hospital Infection*, vol. 66, no. 2, pp. 148–55.

Clement, J.P, Valdmanis, V.G., Bazzoli, G.J., Zhao, M., and Chukmaitov, A. 2008, 'Is more better? An analysis of hospital outcomes and efficiency with a DEA model of output congestion', *Health Care Management Science*, vol. 11, pp. 67–77.

Clezy, K., Cruickshank, M., Ferguson, J., Givney, R., Jorm, C., McLaws, M., Peterson, A. and Russo, P. 2008, 'Surveillance and quality improvement', in Cruickshank, M. and Ferguson, J. (eds), *Reducing Harm to Patients from Health Care Associated Infection: The Role of Surveillance*, Australian Commission on Safety and Quality in Health Care, Sydney, pp. 27–49.

CCSC (Clinical Costing Standards Committee) 2006, *clinical costing standard number 7: exclusion of costs for the purpose of clinical costing*, Melbourne, www.ccsaa.com/standards/clinical-costing-standard-7-exclusion-of-costs-for-the-purpose-of-clinical-costing.htm (accessed 27 August 2009).

COAG (Council of Australian Governments) 2007, *Council of Australian Governments' Meeting, 20 December 2007, Communiqué*, www.coag.gov.au/coag_meeting_outcomes/2007-12-20/cooag20071220.pdf (accessed 31 July 2009).

—— 2008a, *Council of Australian Governments' Meeting, 29 November 2008, Attachment A Health and Ageing*, www.coag.gov.au/coag_meeting_outcomes/2008-11-29/attachments.cfm#attachmenta (accessed 14 September 2009).

—— 2008b, *Council of Australian Governments' Meeting, 29 November 2008, Communiqué,* Canberra, www.coag.gov.au/intergov_agreements/federal_financial_relations/index.cfm (accessed 14 September 2009).

—— 2008c, *Intergovernmental Agreement on Federal Financial Relations*, www.coag.gov.au/intergov_agreements/federal_financial_relations/docs/IGA_federal_financial_relations.pdf (accessed 26 May 2009).

—— 2008d, *National Healthcare Agreement*, Canberra, www.coag.gov.au/intergov_agreements/federal_financial_relations/docs/IGA_FFR_ScheduleF_National_Healthcare_Agreement.rtf (accessed 26 May 2009).

—— 2008e, *National Partnership Agreement on Hospital and Health Workforce Reform*, www.coag.gov.au/intergov_agreements/federal_financial_relations/docs/national_partnership/national_partnership_on_hospital_and_health_workforce_reform.pdf (accessed 14 September 2009).

Coelli, T. Rao, D.S.R, and G.E. Battese, 1998, *An Introduction to Efficiency and Productivity Analys*is, Kluwer Academic.

Coelli, T. Rao, D.S.R, O'Donnell, C.J. and G.E. Battese, 2005, *An introduction to efficiency and productivity analysis*, Springer, New York.

Collignon, P., Dreimanis, D., Ferguson, J., Van Gessel, H., Taylor, P., Wilkinson, I., and Worth, L. 2008, 'Bloodstream Infection', in Cruickshank, M. and Ferguson, J. (eds), *Reducing Harm to Patients from Health Care Associated Infection: The Role of Surveillance*, Australian Commission on Safety and Quality in Health Care, Sydney, pp. 53–89.

Collignon, P., Nimmo, G., Gottlieb, T. and Gosbell I. 2005, 'Staphylococcus aureus bacteremia, Australia', *Emerging Infectious Diseases*, vol. 11, no. 4, pp. 554–61.

Collignon, P., Wilkinson, I., Gilbert, G., Grayson, M. and Whitby, R. 2006, 'Health care-associated Staphylococcus aureus bloodstream infections: a clinical quality indicator for all hospitals', *Medical Journal of Australia*, vol. 184, no. 8, pp. 404–06.

Coory, M.D., Koh, G.T., Flenady, V. and Kamp, M. 2009, Letter in response to 'Adverse outcomes of labour in public and private hospitals in Australia', *Medical Journal of Australia*, vol. 191, no. 10, p. 578.

Cosgrove, S., Sakoulas, G., Perencevich, E., Schwaber, M., Karchmer, A. and Carmeli, Y. 2003, 'Comparison of mortality associated with methicillin-resistant and methicillin-susceptible Staphylococcus aureus bacteremia: a meta-analysis', *Clinical Infectious Diseases*, vol. 36, no. 1, pp. 53–59.

Crotty, B. J. 2005, ‘More students and less patients: the squeeze on medical teaching resources’, *Medical Journal of Australia*, vol. 183, no. 9, pp. 444-45.

Cruickshank, M. and Ferguson, J. (eds) 2008, *Reducing Harm to Patients from Health Care Associated Infection: The Role of Surveillance*, Australian Commission on Safety and Quality in Health Care, Sydney.

Dailey, L. van Gessel, H. and Peterson, A. 2009, ‘Two years of surgical site infection surveillance in Western Australia: analysing variation between hospitals’, *Healthcare Infection*, vol. 14, pp. 51–60.

Deeble, J. 1965, ‘An economic analysis of hospital costs’, *Medical Care*, vol. 3, no. 3, pp. 138–46.

Department of Health Victoria 2009, *Nurses (Victorian Public Health Sector) Multiple Business Agreement 2007-2011,* Melbourne, www.health.vic.gov.au/__data/assets/pdf_file/0008/356696/Nurses-Public-Sector-EBA-2004-2007-_AG840794-2.pdf (accessed 20 November 2009).

Department of Finance and Administration 2006, *Handbook of Cost-Benefit Analysis*, Canberra, www.finance.gov.au/publications/finance-circulars/2006/docs/Handbook_of_CB_analysis.pdf (accessed 9 September 2009).

DHS (Victorian Department of Human Services) 2008, *Sentinel Event Program: Annual Report 2007-08, Building Foundations to Support Patient Safety*, Melbourne.

—— 2009 *Elective surgery performance data July 2008 to June 2009*, Melbourne, http://serviceforip.webcentral.com.au/yourhospitals/performance.asp.

Dietz, H.P. and Peek, M.J. 2004, ‘Will there ever be an end to the Caesarean section rate debate?’, *Australian and New Zealand Journal of Obstetrics and Gynaecology*, vol. 44, pp. 103–06.

DOHA (Department of Health and Ageing) 2004, *Australian Refined Diagnosis Related Groups Version 5.1: Definitions Manual*, Canberra.

—— 2008a, *A Users Guide for the Collection of Hospital Casemix Protocol (HCP) And Private Hospital Data Bureau (PHDB)*, Canberra, www.health.gov.au/internet/main/publishing.nsf/Content/303919F7B92DC9B5CA25701C00007E3B/$File/Data%20Definitions%20Manual.pdf (accessed 17 August 2009).

—— 2008b, *Cost Report 11 (2006-07)*, Canberra, www.health.gov.au/internet/main/publishing.nsf/Content/5F8B6BE822DC75B3CA25748300164037/$File/R11CostReport_Final.pdf (accessed 24 April 2009).

—— 2008c, *National Hospital Cost Data Collection: Reference Manual Round 11 (2006-07),* Canberra, www.health.gov.au/internet/main/publishing.nsf/Content/

90F1A1681D35BCA4CA2570BC0015B1FC/$File/Round%2011.pdf (accessed 18 September 2009).

—— 2008d, *Private Health Insurance*, Canberra, www.health.gov.au/internet/main/publishing.nsf/Content/health-privatehealth-outofpocket-expenses (accessed 8 July 2009).

—— 2009a, *Cost Report Round 12 (2007-08),* Canberra, www.health.gov.au/internet/main/publishing.nsf/Content/0BF59B7DB88A427FCA257609001FCD3D/$File/1_R12CostReport.pdf (accessed 18 September 2009).

—— 2009b, List of caveats for the round 12 National Hospital Cost Data Collection (NHCDC) Private Cost Weight Tables, Canberra, www.health.gov.au/internet/main/publishing.nsf/Content/0BF59B7DB88A427FCA257609001FCD3D/$File/8_PrivateCWEst51.xls (accessed 25 September 2009).

—— 2009c, Private Hospitals @ 9 September 2009, www.health.gov.au/internet/main/publishing.nsf/Content/0476BA161BDC3A0BCA257376001DA7D5/$File/Private%20Hospitals%20@%2009.09.09.xls (accessed 24 September 2009).

—— 2009d, Prostheses List — Excel version, www.health.gov.au/internet/main/Publishing.nsf/Content/prostheses-list-excel.htm (accessed 5 November 2009).

—— 2009e, Public Hospitals @ 9 September 2009, www.health.gov.au/internet/main/publishing.nsf/Content/0476BA161BDC3A0BCA257376001DA7D5/$File/Public%20Hospitals%20@%2009.09.09.xls (accessed 24 September 2009).

—— 2009f, *State of Our Public Hospitals,* Canberra, www.health.gov.auinternet/main/publishing.nsf/Content/1186FF4200B2B2E6CA2575D9000F73B8/$File/SoOPH%202009.pdf (accessed 3 August 2009).

—— 2009g, *The Expanded Specialist Training Program*, www.health.gov.au/internet/main/publishing.nsf/Content/work-pr-estp-infopro (accessed 31 August 2009).

DOH SA (SA Department of Health) 2006, *South Australian Safety and Quality Framework & Strategy 2007-2011: Project Report and Resource Documents a System Wide Approach to Sustainable Safety and Quality Care and Services*, Adelaide.

Department of Treasury and Finance (Tasmania) 2008a, *Pay-roll Tax Rates and Thresholds in Tasmania,* Hobart, www.treasury.tas.gov.au/domino/dtf/dtf.nsf/5fa9db889309e2314a256819001d8eb2/cea6079c368bfc56ca25693f00032739?OpenDocument (accessed 6 March 2009).

—— 2008b, *Employers Guide to Payroll Tax Payroll Tax Act 2008,* Hobart, www.treasury.tas.gov.au/domino/dtf/dtf.nsf/v-sro/F2078DA7D1560837CA25702D001AF8D0/$file/EmpGuideToPTX.pdf (accessed 6 March 2009).

Dor, A. and Farley, D.E. 1996, 'Payment source and the cost of hospital care: evidence from a multiproduct cost function with multiple payers', *Journal of Health Economics*, vol. 15, pp. 1–21.

Dormont, B. and Milcent, C. 2004, 'The sources of hospital cost variability', *Health Economics*, vol. 13, pp. 927–39.

Eckermann, S. and Coelli, T. 2008, 'Including Quality Attributes in a Model of Health Care Efficiency: A Net Benefits Approach', Centre for Efficiency and Productivity Analysis, Working paper no. WP03/2008 University of Queensland.

Erlandsen, E., 2008, 'Improving the efficiency of health care spending: what can be learnt from partial and selected analyses of hospital performance?' *OECD Journal of Economic Studies*, vol. 2008, no. 1, pp. 49–69.

Evans, N., Malcolm, G. and Gordon, A. 2009, Letter in response to 'Adverse outcomes of labour in public and private hospitals in Australia', *Medical Journal of Australia*, vol. 191, no. 10, p. 579.

Evans, R.G. and Walker, H. 1972, 'Information theory and the analysis of hospital cost structure', *Canadian Journal of Economics*, vol. 5, no. 3, pp. 398–418.

Färe, R., Grosskopf, S., Lovell, C.A.K. and Pasurka, C. 1989, 'Multilateral productivity comparisons when some outputs are undesirable: a nonparametric approach', *Review of Economics and Statistics*, vol. 71, no. 1, pp. 90–98.

Färe, R., Grosskopf, S., and Valdmanis, V. 1989, 'Capacity, competition and efficiency in hospitals: a non-parametric approach', *Journal of Productivity Analysis*, vol. 1, pp. 123–39.

Färe, R., and Primont, D. 1990, 'A distance function approach to multi-output technologies', *Southern Economic Journal*, vol. 56, pp. 879–91.

—— 1995*, Multi-Output Production and Duality: Theory and Applications,* Kluwer Academic, Boston.

Färe, R., Grosskopf, S., Lindgren, B. and Poullier, J. P. 1997, 'Productivity growth in health care delivery', *Medical Care*, vol. 35, no. 4, pp. 354–66.

Farrell, M.J. 1957, 'The measurement of productive efficiency', *Journal of the Royal Statistical Society,* vol. 120, no. 3, pp. 253–90.

Feldstein, M.S. 1967, *Economic Analysis for Health Service Efficiency*, North Holland, Amsterdam.

Ferrari, A. 2006, ‘The internal market and hospital efficiency: a stochastic distance function approach’, *Applied Economics*, vol. 38, pp. 2121–30.

Ferrier, G. and Valdmanis, V. 1996, ‘Rural hospital performance and its correlates’, *Journal of Productivity Analysis*, vol. 7, pp. 63–80.

Folland, S.T. and Hofler, R.A. 2001, ‘How reliable are hospital efficiency estimates? Exploiting the dual to homothetic production’, *Health Economics*, vol. 10, pp. 682–98.

Forero, R. and Hillman, K. 2008, *Access Block and Overcrowding: A Literature Review*, Prepared for the Australasian College for Emergency Medicine, Simpson Centre for Health Services Research, South Western Sydney Clinical School, University of New South Wales.

Friedman, N., Bull, A., Russo, P., Gurrin, L. and Richards, M. 2007, ‘Performance of the National Nosocomial Infections Surveillance risk index in predicting surgical site infection in Australia’, *Infection Control and Hospital Epidemiology,* vol. 28, no. 1, pp. 55–59.

Gabbitas, O. and Jeffs, C. 2008, *‘Assessing productivity in the delivery of public hospital services*: *some experimental estimates’,* Paper presented to the Australian Health Economics Conference, Adelaide, 2–3 October 2008.

Garling Review (Special Commission of Inquiry into Acute Care Services in NSW Public Hospitals) 2008, *Final Report of the Special Commission of Inquiry Acute Care Services in NSW Public Hospitals: Overview*, Sydney.

Gerdtham, U.G., Löthgren, M., Tambour, M. and Rehnberg, C. 1999, ‘Internal markets and health care efficiency: a multiple-output stochastic frontier analysis’, *Health Economics*, vol. 8, pp. 151–64.

Goss, J. 2008, *Projection of Australian Health Care Expenditure by Disease: 2003 to 2033*, Australian Institute of Health and Welfare, Cat. no. HWE 43, Canberra.

Granneman, T.W., Brown, R.S. and Pauly, M.V. 1986, ‘Estimating hospital costs: a multiple-output analysis’, *Journal of Health Economics*, vol. 5, no. 2, pp. 107-27.

Graves, N., Halton, K. and Robertus, L. 2008, ‘Costs of Health Care Associated Infection’, in Cruickshank, M. and Ferguson, J. (eds), *Reducing Harm to Patients from Health Care Associated Infection: The Role of Surveillance*, Australian Commission on Safety and Quality in Health Care, Sydney, pp. 307–35.

Greene, W.H. 1997, ‘Frontier Production Functions’, in Pesaran, H.M and Schmidt, P. (eds), *Handbook of Applied Econometrics, Volume II, Microeconomics,* Blackwell, Oxford, pp. 81–166.

Grosskopf, S., Margaritis, D., Valdmanis, V., 1995, ‘Estimating output substitutability of hospital services: a distance function approach’, *European Journal of Operational Research*, vol. 80, pp. 575–87.

Grosskopf, S., Hayes, K., Taylor, L. and Weber, W. 1997, ‘Budget constrained frontier estimation of fiscal equality and efficiency in schooling’, *Review of Economics and Statistics*, vol. 79, pp. 116–24.

Harper, R.W. 2007, ‘Drug-eluting coronary stents — a note of caution’, *Medical Journal of Australia*, vol. 186, no. 5, pp. 253–55.

Harrison, J.P, Coppola, M.N. and Wakefield, M. 2004, ‘Efficiency of federal hospitals in the United States’, *Journal of Medical Systems*, vol. 28, no. 5, pp. 411–22.

Harrison, J.P. and Sexton, C. 2006, ‘The improving efficiency frontier of not-for-profit religious hospitals’, *Hospital Topics*, vol. 84, no. 1, pp. 2–10.

Hasan, M. 2001, ‘Readmission of patients to hospital: still ill defined and poorly understood: counterpoint’, *International Journal for Quality in Health Care*, vol. 13, no. 3, pp. 177–79.

HQCC (Health Quality and Complaints Commission) 2009, *Quality of Health Services — Duty of Provider*, Version: 1.1, Brisbane.

Healthscope Limited 2007, *Annual Report*, Melbourne, www.healthscope.com.au/info/general/Document/get/329/documentId/ (accessed 8 September 2009).

—— 2009a, About Us, Melbourne, www.healthscopehospitals.com.au/info/general/Content/get/205/itemId/ (accessed 25 September 2009).

—— 2009b, Careers at Healthscope, www.healthscope.com.au/info/general/Content/get/221/itemId/ (accessed 6 August 2009).

Heckman, J. 1976, ‘The common structure of statistical models of truncation, sample selection and limited dependent variables and a simple estimator for such models,’ *Annals of Economic and Social Measurement*, vol. 5, no. 4, pp. 475–92.

Herr, A., 2008, ‘Cost and technical efficiency of German hospitals: does ownership matter?’, *Health Economics*, vol. 17, pp. 1057–71.

Hofmarcher, M.M., Paterson, I. and Riedel, M. 2002, ‘Measuring hospital efficiency in Austria – A DEA Approach’, *Health Care Management Science*, vol. 5, pp. 7–14.

Hollingsworth, B. 2008, ‘The measurement of efficiency and productivity of health care delivery’, *Health Economics*, vol. 17, pp. 1107–28.

Hollingsworth, B. and Peacock, S. 2008, *Efficiency Measurement in Health and Health Care*, Routledge, London.

Hurley, E., McRae, I., Bigg, I., Stackhouse, L., Boxall, A. and Broadhead, P. 2009, *The Australian Health Care System: The Potential for Efficiency Gains — A Review of the Literature*, Background paper prepared for the National Health and Hospitals Reform Commission, Canberra, www.nhhrc.org.au /internet/nhhrc/publishing.nsf/Content/A5665B8B9EAB34B2CA2575CB00184 FB9/$File/Potential%20Efficiency%20Gains%20-%20NHHRC%20Background %20Paper.pdf (accessed 27 July 2009).

Ipsos Australia 2005, *Consumer Survey – Informed Financial Consent, Melbourne*, www.health.gov.au/internet/main/publishing.nsf/Content/6E7A49A 4305C2B72CA25743B000C12BF/$File/consumer_survey.pdf (accessed 30 April 2009).

—— 2007a, *Consumer Survey – Informed Financial Consent*, Melbourne, www.health.gov.au/internet/main/publishing.nsf/Content/6E7A49A4305C2B72 CA25743B000C12BF/$File/FINAL%20REPORT_IFC%20survey%202006%20 %2020070313.pdf (access 30 April 2009).

—— 2007b, *Ipsos Healthcare and Insurance Australia Report,* Melbourne.

—— 2008, *Consumer Survey – Informed Financial Consent 2007*, Melbourne, www.health.gov.au/internet/main/publishing.nsf/Content/6E7A49A4305C2B72 CA25743B000C12BF/$File/IFC%20Report%202007%20-20Ipsos%20Final.pdf (accessed 14 April 2009).

Jackson, T. 2008, *'Hospital Acquired Diagnoses: At What Cost?'* Presentation to the National Forum on Safety and Quality in Health Care, Adelaide, 30 October, www.achs.org.au/pdf/thur.plen4.jackson.pdf (accessed 14 September 2009).

Jackson, T.J., Michel, J.L., Roberts, R.F., Jorm, C.M. and Wakefield, J.G. 2009, 'A classification of hospital-acquired diagnoses for use with routine data', *Medical Journal of Australia*, vol. 191, no. 10, pp. 544–8.

Jackson, T.J., Ngheim H.S., Rowell, D., Jorm, C. and Wakefield, J. 2009, 'Setting economic priorities for patient safety programs and patient safety research using casemix costing data', *BMC Health Services Research*, vol. 9, Supplement 1, p. A4.

Jacobs, R. 2001, 'Alternative methods to examine hospital efficiency: data envelopment analysis and stochastic frontier analysis', *Health Care Management Science*, vol. 4, no. 2, pp. 103–15.

Jarvis, W. 2003, ‘Benchmarking for prevention: The Centres for Disease Control and Prevention’s National Nosocomial Infections Surveillance (NNIS) system experience’, *Infection*, vol. 31, Supplement 2, pp. 44–8.

Jensen, P.H, Webster, E. and Witt, J. 2007, ‘Hospital Type and Patient Outcomes: An Empirical Examination Using AMI Re-admission and Mortality Records’, Melbourne Institute Working paper no. 31/07, Melbourne.

Katz, J.N., Losina, E., Barrett, J., Phillips, C.B., Mahomed, N.N., Lew, R.A., Guadagnoli, E., Harris, W.H., Poss, R. and Baron, J.A. 2001, ‘Association between hospital and surgeon procedure volume and outcomes of total hip replacement in the United States Medicare population’, *Journal of Joint and Bone Surgery*, vol. 83, pp. 1622–9.

KPMG (2009), Report for Catholic Health Australia on Concessional Tax Benefits for Not-for-profit Hospitals and Aged Care Services, Attachment to submission made to Contribution of the Not for Profit Sector study, www.pc.gov.au/__data/assets/pdf_file/0006/92607/subdr198-attachment.pdf (accessed 24 November 2009).

Kumbhakar, S.C. and Lovell, C.A. Knox 2000, *Stochastic Frontier Analysis*, Cambridge University Press, Cambridge.

Lave, J.R. 1966, ‘A Review of the Methods Used to Study Hospital Costs’, *Inquiry*, vol. 3, pp. 57–81.

LAOS (Limited Adverse Occurrence Screening) Victoria 2008, *Limited Adverse Occurrence Screening (LAOS): Annual Report for 2007-08*, Department of Human Services, Melbourne, www.health.vic.gov.au/clinrisk/downloads/laos-prog-report.pdf (accessed 2 August 2009).

Linna, M. 1998, ‘Measuring hospital cost efficiency with panel data models’, *Health Economics*, vol. 7, no. 5, pp. 415–27.

Löthgren, M. 2000, ‘Specification and estimation of stochastic multiple-output production and technical inefficiency’, *Applied Economics*, vol. 32 pp. 1533–40.

Mangano, M. 2003, *A Stochastic Frontier Examination of Victorian Public Hospitals*, Paper presented at 2003 PhD Conference in Economics and Business, Perth, November.

—— 2006, *Frontier Methods for Comparing Public Hospital Efficiency: The Effect of Casemix Funding in Victoria*, PhD Thesis, School of Economics and Finance, Curtin University of Technology, Western Australia.

Maniadakis, N. and Thanassoulis, E. 2000, 'Assessing productivity changes in UK hospitals reflecting technology and input prices', *Applied Economics*, vol. 32, pp. 1575-89.

Mascinie, E., and Bonten, M. 2005, 'Vancomycin resistant enterococci: Consequences for therapy and infection control', *Clinical Microbiology Infection*, Supp, vol. 11, supplement 4, pp. 43–56.

McClure, B. 2004, *EV gets into Gear,* Investopedia, Edmonton, www.investopedia.com/articles/fundamental/04/031004.asp (accessed 30 September 2009).

McGregor, A., Riley, T. and Van Gessel, H. 2008, 'Clostridium difficile associated disease', in Cruickshank, M. and Ferguson, J. (eds), *Reducing Harm to Patients from Health Care Associated Infection: The Role of Surveillance*, Australian Commission on Safety and Quality in Health Care, Sydney, pp. 171–87.

McLean, S.M. and Clark, D.J. 2008, 'A shift in the use of drug-eluting stents in Australian private hospitals', *Medical Journal of Australia*, vol. 188, no. 2, p. 127.

Medew, J. 2009, 'Inquiry told of delays in critical care', *The Age*, Wednesday 19 August 2009, p. 3.

Medibank Private 2009, *Private patients highly satisfied with hospital care*, Media release, 15 September.

Meeusen, W. and van den Broeck, J. 1977, 'Efficiency estimation from Cobb–Douglas production functions with composed error', *International Economic Review*, vol. 18, no. 2, pp. 435–44.

Morey, R.C. and Dittman, D.A. 1996, 'Cost pass-through reimbursement to hospitals and their impact on operating efficiencies', *Annals of Operations Research*, vol. 67, pp. 117–39.

Mortimer, D. 2002, *Competing Methods for Efficiency Measurement: A Systematic Review of Direct DEA vs SFA/DFA Comparisons*, Centre for Health Program Evaluation, Working paper no. 136, Monash University, Melbourne.

Nayar, P. and Ozcan, Y. 2008, 'Data envelopment analysis comparison of hospital efficiency and quality', *Journal of Medical Systems*, vol. 32, pp. 198–9.

NHHRC (National Health and Hospitals Reform Commission) 2008, *A Healthier Future For All Australians – Interim Report December 2008,* Canberra, www.nhhrc.org.au/internet/nhhrc/publishing.nsf/Content/BA7D3EF4EC7A1F2BCA25755B001817EC/$File/NHHRC.pdf (accessed 28 July 2009).

—— 2009, *A Healthier Future for All Australians – Final Report June 2009,* Canberra, www.nhhrc.org.au/internet/nhhrc/publishing.nsf/Content/1AFD

EAF1FB76A1D8CA257600000B5BE2/$File/Final_Report_of_the%20nhhrc_June_2009.pdf (accessed 28 July 2009).

NHPC (National Health Performance Committee) 2001, *National Health Performance Framework Report*, Report to the Australian Health Ministers' Conference, Queensland Health, Brisbane.

—— 2002, *National Report on Health Sector Performance Indicators 2001*, Queensland Health, Brisbane.

—— 2004, *National Report on Health Sector Performance Indicators 2003*, Australian Institute of Health and Welfare, Cat. No. HWI 78, Canberra.

NMHWG (National Mental Health Working Group) 2005, *Key Performance Indicators for Australian Public Mental Health Services*, ISC Discussion Paper no.6, Australian Government Department of Health and Ageing, Canberra.

Newhouse, J. 1994, 'Frontier estimation: how useful a tool for health economics?', *Journal of Health Economics*, vol. 13, pp. 317–22.

Nguyen, K. and Coelli, T. 2009, *Quantifying the effects of modelling choices on hospital efficiency measures: A meta-regression analysis,* Centre for Efficiency and Productivity Analysis, WP07/2009, University of Queensland, www.uq.edu.au/economics/cepa/docs/WP/WP072009.pdf (accessed 12 November 2009).

Nimmo, G., Coombs, G., Pearson. J., O'Brien, F., Christiansen, K., Turnidge, J., Gosbell, I., Collignon, P. and McLaws, M. 2006, 'Methicillin-resistant Staphylococcus aureus in the Australian community: an evolving epidemic', *Medical Journal of Australia*, vol. 184, no. 8, pp. 384–8.

NSW Department of Health nd, *Monthly Hospital Performance Reports*, www.health.nsw.gov.au/reports/reports.asp, Sydney (accessed 28 July 2009).

—— 2005a, *Infection Control Program Quality Monitoring*, Policy Directive PD2005_414, Sydney.

—— 2005b, *NSW Patient Safety and Clinical Quality Program*, NSW Department of Health, Sydney, www.health.nsw.gov.au/policies/pd/2005/pdf/PD2005_608.pdf (accessed 16 September 2009).

—— 2008, *Healthcare Associated Infection: Clinical Indicator Manual:* Version 2.0, Sydney.

NSW Nurses' Association 2009, *Ramsay members vote yes!,* www.nswnurses.asn.au/news/19653.html (accessed 5 August 2009).

OSQHC (Office of Safety and Quality in Health Care, Western Australia) nd, *Office of Safety and Quality in Health Care*, WA Department of Health, www.safetyandquality.health.wa.gov.au/home/index.cfm (accessed 8 September 2009).

—— 2006, 'Report on WA data collected by the Australian Incident Monitoring System (AIMS): 1 October 2005 to 30 December 2005', WA Department of Health, Perth www.safetyandquality.health.wa.gov.au/docs/aims/AIMS_ Quarterly_Report_(Oct-Dec05).pdf (accessed 8 September 2009).

Office of the Privacy Commissioner 2009a, Privacy Law, Canberra, www.privacy.gov.au/law (accessed 12 November 2009).

—— 2009b, The Australian Bureau of Statistics (ABS) has asked me to complete a survey. Do I have to answer the questions in the survey?, Canberra, www.privacy.gov.au/faq/individuals/q16 (accessed 12 November 2009).

Office of State Revenue (New South Wales) 2007, NSW Payroll Tax Information for Employers. Sydney, www.osr.nsw.gov.au/lib/doc/factsheets/ofs_pt3_2007. pdf (accessed 6 March 2009).

—— 2008, Rates and Thresholds, Sydney, www.osr.nsw.gov.au/taxes/payroll/ general/rates/ (accessed 6 March 2009).

Office of State Revenue (Queensland) 2009a, Deductions, Brisbane, www.osr.qld.gov.au/payroll-tax/payroll-tax-returns/deductions.shtml (accessed 6 March 2009).

—— 2009b, Exempt Institutions and Exempt Charitable Institutions,. Brisbane. www.osr.qld.gov.au/legislation-rulings/public-rulings/general/gen003 -1.shtml (accessed 6 March 2009).

—— 2009c, Previous Rates and Thresholds, Brisbane, www.osr.qld.gov.au/ historical-information/previous-rates-thresh/index.shtml (accessed 6 March 2009).

Office of State Revenue (Western Australia) 2007, Payroll Tax – General Information, Perth, www.dtf.wa.gov.au/cms/uploadedFiles/General_Information _July_2007.pdf (accessed 6 March 2009).

OECD (Organisation for Economic Co-operation and Development) 2003, *Private Health Insurance in Australia: A Case Study*, Paris.

—— 2009a, *OECD Health Data 2009: How Does Australia Compare*, Paris.

O'Neill, L. 1998, 'Multifactor efficiency in data envelopment analysis with an application to urban hospitals', *Health Care Management Science*, vol. no. 1, pp. 19–27.

O'Neill, L., Rauner, M., Heidenberger, K., and Kraus, M. 2008, 'A cross-national comparison and taxonomy of DEA-Based hospital efficiency studies', *Socio-Economic Planning Sciences*, vol. 42, pp. 158–89.

Paul, C.J.M. 2002, 'Productive structure and efficiency of public hospitals', in Fox, K. J. (ed), *Efficiency in the Public Sector*, Kluwer Academic Publishers, Boston.

Peacock, S., Chan, C., Mangolini, M. and Johansen, D. 2001, 'Techniques for Measuring Efficiency in Health Services', Staff Working paper, Productivity Commission, July.

Pesce, A.F. 2009, 'Private obstetric intervention: good, bad or whatever?, *Medical Journal of Australia*, vol. 90, no. 9, pp. 467–468.

Preen D.B., Holman C.D.J., Semmens J.B., Spilsbury K., Brameld K.J. 2006, 'Length of comorbidity lookback period affected regression model performance of administrative health data', *Journal of Clinical Epidemiology,* vol. 59, no. 9, pp. 940–6.

PHIAC (Private Health Insurance Administration Council) 2003, *Operations of the Registered Health Benefits Organisations Annual Report 2002-03*, Canberra.

—— 2004, *Operations of the Registered Health Benefits Organisations Annual Report 2003-04*, Canberra.

—— 2007a, *Operations of the Private Health Insurers Annual Report 2006-07*, Canberra.

—— 2007b, *Quarterly Gap Payment & Medical Benefit Expenses – June 2007*, Canberra, www.phiac.gov.au/resources/file/gaprptJun2007.pdf (accessed 16 July 2009).

—— 2008, *Operations of the Private Health Insurers Annual Report 2007-08,* Canberra.

—— 2009a, (and previous issues), *Quarterly Gap Payment & Medical Benefit Expenses – September 2009*, Canberra, www.phiac.gov.au/resources/file/P1Gap-Sep09.pdf (accessed 25 November 2009).

—— 2009b, (and previous issues), PHIAC A Report – June 2009, Canberra, www.phiac.gov.au/resources/file/phiacadata/alljun09.pdf (accessed 25 September 2009).

—— 2009c, *Quarterly Statistics: March 2009*, Canberra.

PC (Productivity Commission) 1999a, *An Assessment of the Performance of Australian Railways: 1990 to 1998*, Supplement to Inquiry Report on Progress in Rail Reform, AusInfo, Canberra.

—— 1999b, *Private Hospitals in Australia*, Commission Research paper, AusInfo, Canberra.

—— 2005, *Economic Implications of an Ageing*, Research Report, Canberra.

—— 2006a, *Potential Benefits of the National Reform Agenda,* Report to the Council of Australian Governments, Canberra.

—— 2006b, *Waste Management,* Inquiry Report, Canberra.

—— 2008a, *Assessing Local Government Revenue Raising Capacity*, Research Report, Canberra.

—— 2008b, *Chemicals and Plastics Regulation*, Research Report, Canberra.

—— 2009, *Contribution of the Not-for-Profit Sector*, Draft Research Report, Canberra.

Prior, D. 2006, 'Efficiency and total quality management in health care organizations: a dynamic frontier approach', *Annals of Operations Research*, vol. 145, pp. 281–299.

Private Health Insurance Ombudsman 2009, Glossary*,* www.privatehealth.gov.au/glossary.htm (accessed 16 July 2009).

Quan, H., Sundarajan, V., Halfon, P., Fong, A., Burnand, B., Luthi, J-C, Saunder, L.D., Beck, C.A., Feasby, T.E. and W.A. Ghali 2005, 'Coding algorithms for defining comorbidities in ICD-9-CM and ICD-10 administrative data', *Medical Care*, vol. 43 no. 1, pp. 1130-9.

Queensland Department of Health 2004, *Measured Quality Service*, Report to Board of Management, Brisbane.

RACS (Royal Australasian College of Surgeons) 2008, *Surgical Audit and Peer Review: A Guide by the Royal Australasian College of Surgeons*, 3rd edn, Melbourne.

Ramsay Health Care Limited 2007, *Annual Report,* Sydney, www.ramsayhealth.com.au/annualreport2007/Annual%20Report%202007%20web.pdf (accessed 8 September 2009).

—— 2008, *Annual Report,* Sydney, www.ramsayhealth.com.au/annualreport2008/Annual%20Report%202008%20web.pdf (accessed 14 September 2009).

—— 2009a, About Ramsay Health Care, Sydney, www.ramsayhealth.com.au/profile/profile.asp (accessed 9 September 2009).

—— 2009b, Opportunities for Doctors, www.opps4docs.com.au/specialties/specialists.asp (accessed 5 August 2009).

—— 2009c, The Ramsay Way, www.ramsayhealth.com.au/news/documents/TRW_09_Sept.pdf (accessed 20 November 2009).

Revenue SA 2008, Payroll Tax – A guide to legislation, Adelaide, www.revenuesa.sa.gov.au/circulars/prtguidec303.pdf (accessed 10 March 2009)

—— 2009, Payroll Tax, Adelaide, www.revenuesa.sa.gov.au/index.html? www.revenuesa.sa.gov.au/taxes/payroll.html (accessed 6 March 2009).

Richardson, J. (2005), Priorities of health policy: cost shifting or population health, *Australia and New Zealand Health Policy*, vol. 2, issue 1.

Richards, M. and Russo, P. 2007, 'Surveillance of hospital-acquired infections in Australia — one nation, many states', *Journal of Hospital Infection*, vol. 65, no. 52, pp. 174–81.

Robinson, M. 2008, 'Standing Committee on Economics', *Debates*, 21 July.

Robson, S.J., Laws, P. and Sullivan, E.A., 2009, 'Adverse outcomes of labour in public and private hospitals in Australia', *Medical Journal of Australia*, vol. 190, no. 9, p. 474-7.

Rosko, M.D. and Chilingerian, J.A. 1999, 'Estimating hospital inefficiency: does casemix matter?', *Journal of Medical Systems*, vol. 23, no. 1, pp. 57–71.

Royal College of Pathologists Australasia (RCPA) 2009, *Manual of Use and Interpretation of Pathology Tests*, 5th edn, www.rcpamanual.edu.au/sections/clinicalproblem.asp?s=25&i=109 (accessed 24 August 2009).

SA Department of Health 2005a, *MRO Surveillance Definitions*, Infection Control Service, Adelaide.

—— 2005b, *South Australian Statewide Nosocomial Bloodstream Infection Report 2005*, Infection Control Service, Adelaide.

—— 2006, *Improving the System: South Australian Patient Safety Report 2003-04*, Adelaide.

—— 2008, *Methicillin Resistant Staphylococcus Aureus (MRSA): Frequently Asked Questions*, Adelaide.

—— 2009a, *Statewide MRSA Report: All Contributors: March 2009*, Infection Control Service, Adelaide.

—— 2009b, *Vancomycin-Resistant Enterococci (VRE): Frequently Asked Questions*, Adelaide.

Sammut, J. 2009, *Why Public Hospitals are Overcrowded: Ten Points for Policymakers*, Policy Monograph no. 99, Centre for Independent Studies, Sydney.

Schmidt, P. and Sickles, R.C. 1984, ‘Production frontiers and panel data’, *Journal of Business and Economic Statistics*, vol. 2, pp. 367–74.

Scott, A. and Parkin, D. 1995, ‘Investigating hospital efficiency in the new NHS: the role of the translog cost function’, *Health Economics*, vol. 4, pp. 467–78.

SCRGSP (Steering Committee for the Review of Government Service Provision) 2004, *Report on Government Services 2004*, Productivity Commission, Canberra.

—— 2005, *Report on Government Services 2005*, Productivity Commission, Canberra.

—— 2009, *Report on Government Services 2009*, Productivity Commission, Canberra.

SCRCSSP (Steering Committee for the Review of Commonwealth/State Service Provision) 1997, *Data Envelopment Analysis, A Technique for Measuring the Efficiency of Government Service Delivery*, AGPS, Canberra.

—— 2001, *Asset Measurement In The Costing of Government Services*, Productivity Commission, Canberra.

Sherman, H.D. 1984, ‘Hospital efficiency measurement and evaluation: empirical test of a new technique’, *Medical Care*, vol. 22, no. 10, pp. 922–38.

Siciliani, L. 2006, ‘Estimating technical efficiency in the hospital sector with panel data: a comparison of parametric and non-parametric techniques’, *Applied Health Economics and Health Policy*, vol. 5, no. 2, pp. 99–116.

Skinner, J. 1994, ‘What do stochastic frontier functions tell us about inefficiency?’, *Journal of Health Economics*, vol 13, pp. 317–22.

Solà, M. and Prior, D. 2001, ‘Measuring productivity and quality changes using data envelopment analysis: an application to Catalan hospitals’, *Financial Accountability and Management*, vol. 17, no. 3, pp. 219–45.

Spiegelhalter, D. 2004, ‘Funnel plots for comparing institutional performance’, *Statistics in Medicine*, vol. 24, no. 8, pp. 1185–202.

Sportsmed SA 2009, *Orthopaedics*, Adelaide, www.sportsmed.com.au/AboutUs/OURSERVICES/ORTHOPAEDICS/tabid/68/Default.aspx (accessed 14 April 2009).

Sprivulis, P.C., Da Silva, J-A., Jacobs, I.G., Frazer, A.R.L. and Jelinek, G.A. 2006, ‘The association between hospital overcrowding and mortality among patients admitted via Western Australian emergency departments’, *Medical Journal of Australia*, vol. 184, no. 5, pp. 208–12.

State Revenue Office (Victoria) 2009a, Exemptions / Concessions, Melbourne, www.sro.vic.gov.au/sro/srowebsite.nsf/taxes_exemptions.htm#3 (accessed 6 March 2009).

—— 2009b, Payroll Tax Historical Rates - From 1 July 1997 to 30 June 2006, Melbourne, www.sro.vic.gov.au/sro/srowebsite.nsf/taxes_payroll_hist_rates.htm (accessed 6 March 2009).

Street, A. 2003, 'How much confidence should we place in efficiency estimates?' *Health Economics*, vol. 12, pp. 895–907.

Sundarajan, V., Henderson, T, Perry, C., Muggivan, A., Quan, H. and Ghali, W.A. 2004, New ICD version of the Charlson Index predicted in-hospital mortality, *Journal of Clinical Epidemiology*, vol. 57, pp. 1288-94.

Territory Revenue Office (Northern Territory) 2008a, Employers' Guide to Payroll Tax in the Northern Territory, Darwin, www.nt.gov.au/ntt/revenue/pdf/I-PRT-001.pdf (accessed 6 March 2009).

—— 2008b, Rates and Thresholds, Darwin, www.nt.gov.au/ntt/revenue/rates_thresholds.shtml (accessed 6 March 2009).

Thiel, H. 1967, *Economics and Information Theory*, North-Holland, Amsterdam.

Thomas, C. and Riley, T. 2003, 'Restriction of Third Generation Cephalosporin Use Reduces the Incidence of Clostridium Difficile-Associated Diarrhoea in Hospitalised Patients', *Communicable Diseases Intelligence*, vol. 27, Supplement: Antimicrobial Resistance in Australia, pp. S28–S31.

TIPCU (Tasmanian Infection Prevention and Control Unit) 2009, *Tasmanian Acute Public Hospitals Healthcare Associated Infection Surveillance Report: March 2009*, Department of Health and Human Services, Hobart.

Tong, E., Clements, A., Haynes, M., Jones, M., Morton, A. and Whitby, M. 2009, Improved hospital-level risk adjustment for surveillance of healthcare-associated bloodstream infections: a retrospective cohort study, *BMC Infectious Diseases*, vol. 9, pp. 145–53.

Tracy, S.K., Welsh, A.W., Dahlen, H.G. and Tracy, M.B. 2009, Letter in response to 'Adverse outcomes of labour in public and private hospitals in Australia', *Medical Journal of Australia*, vol. 191, no. 10, pp. 579–80.

Treasury 2007, *Intergenerational Report 2007*, Canberra.

—— 2008a, *Australia's Future Tax System: Consultation paper*, Canberra.

—— 2008b, *Budget Measures 2008-09*, Budget paper no. 2, Canberra.

—— 2008c, *Tax Expenditure Statement*, Canberra.

—— 2009, *Budget Overview 12 May 2009*, Canberra.

Turrell, G., Stanley, L., de Looper, M. and Oldenburg, B. 2006. *Health Inequalities in Australia: Morbidity, Health Behaviours, Risk Factors and Health Service Use.* Health Inequalities Monitoring Series No. 2, AIHW, Cat. No. PHE 72. Queensland University of Technology and the Australian Institute of Health and Welfare, Canberra.

Victorian Auditor-General 2009, *Access to Public Hospitals: Measuring Performance, 2008-09:18*, Melbourne.

Victorian Department of Human Services 2008a, *Type 1 Surveillance Manual*, Version 6, VICNISS Coordinating Centre, Melbourne.

—— 2008b, *Hospital Acquired Infection Project Year 6 Report — August 2008*, Statewide Quality Branch, Rural and Regional Health and Aged Care Services, Melbourne, www.vicniss.org.au/Resources/VICNISSAnnualReport0808.pdf (accessed 11 August 2009).

—— 2009, *Victoria: The 2008-09 Statement of Priorities and Performance Framework Business Rules,* Melbourne, www.health.vic.gov.au/hospital-performance/busrule09.pdf (accessed 11 August 2009).

Vitikainen, K., Street, A., Linna, M. 2009, 'Estimation of hospital efficiency-Do different definitions and casemix measures for hospital outputs affect the results?', *Health Policy*, vol. 89, pp. 149–59.

Vitiliano D.F., and Toren, M., 1994, 'Cost and efficiency in nursing homes: a stochastic frontier approach', *Journal of Health Economics*, vol. 13, pp. 218–300.

WA Department of Health 2008, *Healthcare Infection Surveillance Western Australia Surveillance Manual*, Version 2, Healthcare Associated Infection Unit, Perth.

—— 2009a, *Healthcare-Associated Infection Surveillance In Western Australia*, Healthcare Associated Infection Unit, Operational Directive OD 0197/09, Perth.

—— 2009b, *Healthcare Infection Surveillance Western Australia Annual Report 2007–2008*, Healthcare Associated Infection Unit, Perth.

Wang, J. and Mahmood, A. 2000a, 'Efficiency of the NSW Public Acute Hospitals: An Application of the Data Envelopment Analysis', in Bridges, J. (ed), *Economics and Health: 2000 – Proceedings of the Twenty-second Australian Conference of Health Economists*, University of New South Wales School of Health Services Management, Sydney.

—— 2000b, 'Relative Efficiency of NSW Public Acute Hospitals: A Stochastic Frontier Cost Function Analysis', in Bridges, J. (ed), *Economics and Health:* 2000 – *Proceedings of the Twenty-second Australian Conference of Health*

Economists, School of Health Services Management, University of New South Wales, Sydney.

Webster, R., Kennedy, S. and Johnson, L. 1998, *Comparing Techniques for Measuring the Efficiency and Productivity of Australian Private Hospitals*, Working paper no. 98/3, Australian Bureau of Statistics, Cat. no. 1351.0, Canberra.

Weng, S-J., Wu, T., Blackhurst, J. and Mackulak, G. 2009, 'An extended DEA model for hospital performance evaluation and improvement', *Health Services and Outcomes Research Methodology*, vol. 9, no. 1, pp. 39–53.

Wilson, R.M., Runciman, W.B., Gibberd, R.W., Harrison, B.T., Newby, L. and Hamilton, J.D. 1995, 'The quality in Australian health care study', *Medical Journal of Australia*, vol. 163, no. 9, pp. 458–71.

Women's Hospitals Australasia 2007, *Supporting Excellence in Maternity Care: The Core Maternity Indicators Project,* www.safetyandquality.gov.au/internet/safety/publishing.nsf/Content/3A59DB5FECB57A99CA25753C001B50ED/$File/CMI-Report-Jan2007.pdf (accessed 14 September 2009).

Wooldridge, M. 1996, (Minister for Health and Aged Care), Medicare Levy Amendment Bill (No. 2) 1996 – Second Reading Speech, *Debates*, 13 December.

Wooldridge, M. (Minister for Health and Family Services) 1997, *Legislation Introduced to Reform Private Health Insurance*, Media release no. 140/97, 27 November.

Workplace Authority 2008a, *ANF (Vic. Branch) and HSU (Vic. Branch 1) and The Healthscope Nurses Agreement*, Melbourne. www.ca.workplaceauthority.gov.au/docs/CAs/CAUN085186714.pdf (accessed 20 November 2009).

—— 2008b, *Epworth and Australian Nursing Federation Enterprise Agreement 2008-2012*, Melbourne, www.ca.workplaceauthority.gov.au/docs/CAs/CAUN085284474.pdf (accessed 20 November 2009).

Worthington, A. 2004, 'Frontier efficiency measurement in health care: a review of empirical techniques and selected applications', *Medical Care Research Review*, vol. 61, pp. 135–70.

Yaisarwang, S. and Burgess, J.F. 2006, 'Performance-based budgeting in the public sector: an illustration from the VA health care system', *Health Economics,* vol. 15, pp. 295–310.

Yong, K. and Harris, A. 1999, *Efficiency of Hospitals in Victoria Under Casemix Funding: A Stochastic Frontier Approach*, Centre for Health Program Evaluation, Working paper no. 92, Monash University, Melbourne.

Zuckerman, S., Hadley, J. and Iezzoni, L. 1994, ‘Measuring hospital efficiency with frontier cost functions’, *Journal of Health Economics*, vol. 13, pp. 255–80.