

Health Services Productivity Paradox

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Abstract

This study explores the measurement of productivity within the service sector, in this case the state government sector of health. The algorithm for productivity is relatively simple, and has been applied to the health sector after statistical first principles have been applied, non-vested and normalised data. Not only can the entire health system be measured for productivity but so can each health region, subcategories with the region, e.g. community health, and honed to determine the productivity of professions within the subcategories. This was done for one region in the NSW health system, for community health examining nurses and therapist. For nurses only productivity from 2005 to 2012 has dropped 300% while the health budget had continued to expand, the productivity paradox; the simple correlation between the patients served and the cost of serving each patient has expanded from \$756 in 2005 to \$3262 in 2012. A very reflective study and correction of the productivity paradox within the NSW health system needs a very careful review.

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Productivity is defined as; an average measure of the efficiency of production. It can be expressed as the ratio of output to inputs used in the production process. When all outputs and inputs are included in the productivity measure it is called total productivity [1]. The amount of output per unit of input (labor, equipment, and capital). There are many difference ways of measuring productivity. For example, in a factory productivity might be measured based on the number of hours it takes to produce a good, while in the service sector productivity might be measured based on the revenue generated by an employee divided by their salary. In the Government Health Services productivity is a concept seldom applied and when/if the concept is applied numerous problems occur, more about this later [2]. Simply, productivity is a measure relating a quantity or quality of output to the inputs required to produce it. Labor productivity, can be measured by quantity of output per time spent or numbers employed [3]. Productivity is a ratio that describes the output divided by the input, $\text{Productivity} = \text{Output} / \text{Input}$ [3]. Increase productivity can be gained by either increasing output or decreasing input.

Productivity is how much goods and services are created by an investment of workers and money. High productivity creates more output with less input. It's more valuable because it creates greater profit. It gives the company, industry or country an advantage over their competitors. Productivity measures are used in many ways. governments use them to evaluate whether laws, taxes and other policies increase or impede business growth. Businesses constantly analyse and try to improve productivity in processes, manufacturing and sales to improve the bottom line.

In 1994, Nobel prize-winner Paul Krugman summarised most

economists' views about the importance of the standard measure of productivity: output per worker [4]. In *The Age of Diminishing Expectations* 'productivity isn't everything, but in the long run it is almost everything. A country's ability to improve its standard of living over time depends almost entirely on its ability to raise its productivity [4].

Central banks analyse the overall productivity of an entire economy, to see how well total capacity is being used. If productivity is low, then the economy is in recession. If capacity utilisation is high, then the economy may be in danger of inflation. For these reasons, productivity growth is desired [5].

Most government services especially health involve multi-factor productivity, or, In total factor productivity, can be functional defined in an algorithm [6]. This study is not a multi-factor (total factor) study, rather a basic study government service productivity.

$$MFP = d(\ln f)/dt = d(\ln Y)/dt - sLd(\ln L)/dt - sKd(\ln K)/dt$$

where::

f = the global production function;

Y = output;

t = time;

sL = the share of input costs attributable to labour expenses;

sK = is the share of input costs attributable to capital expenses;

L = a dollar quantity of labour;

K = a dollar quantity of capital.

In this study parameters sK, sL and K will not be used and this algorithm will be condensed to utilised on singular units of service.

Method

This study obtained its data via publicly available sources for one the eight regional health services in NSW. Two first principles of data acquisition were applied to the basic data [7]. Firstly, no data collected by the health service was used; company data often has numerous bias agendas. If data can be corrupted, it will be. Public domain data was used, which does not insure its reliability. This data was non-normalised. The health system data was normalised using additional information

from open sources, hence suitable for statistical analysis. Secondly, database semantics were applied when possible [7].

Results.

Reported to the public is the non-normalised increase in services, referred as 'Occasions of Service', to a rapidly expanding aging population, as shown in Figure one. Note the Occasions of Service (OOS) is not defined nor operational defined [7].

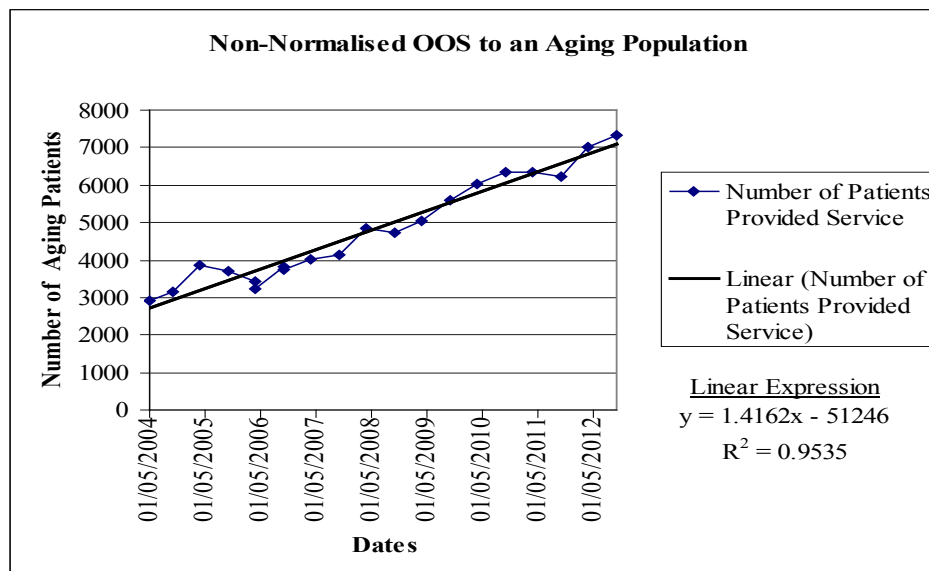


Figure 1. The Number of Patients Served over years

Figure 1 demonstrates a very substantial increase in the services provided to an aging population. But this information has not been normalised; what added government resources are required to provide for the increase services to the aging population? The two main groups in community health providing service are nurses and therapists. Figure two shows the employment rate for nurses and therapists for the seven years but does not include administrators.

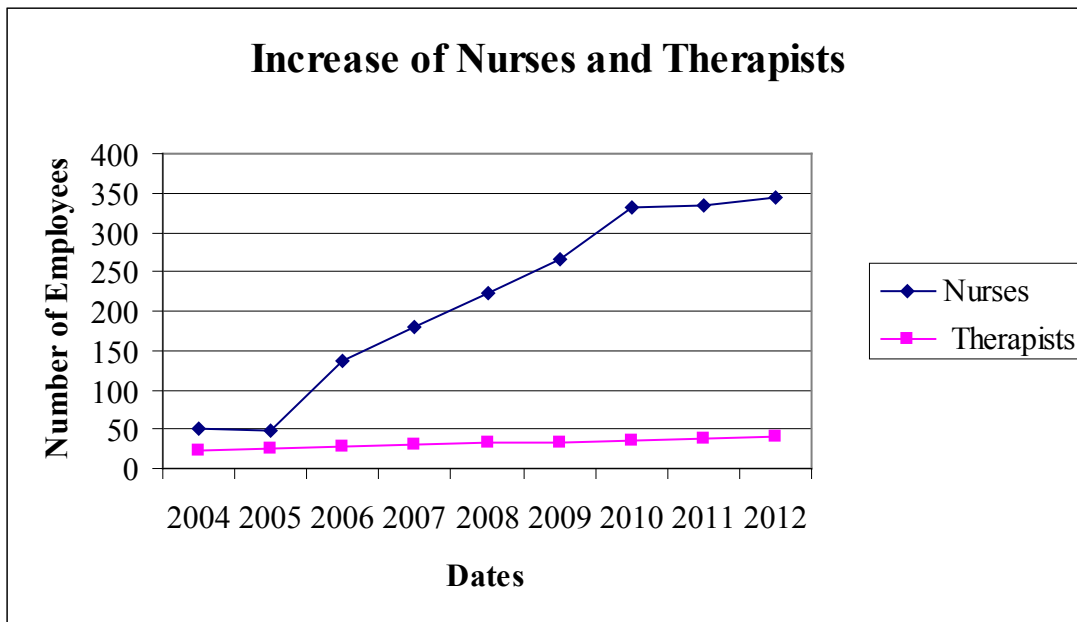


Figure 2. The increased of Nurses and Therapists from 2004 to 2012.

Figure two demonstrates the dramatic increase in nurses. The increase in the direct service providers, nurses and therapists does not include the administrators. When the additional administrators, mostly nurses, are added to the nurses providing direct service, the exponential growth in nurses is further extenuated.

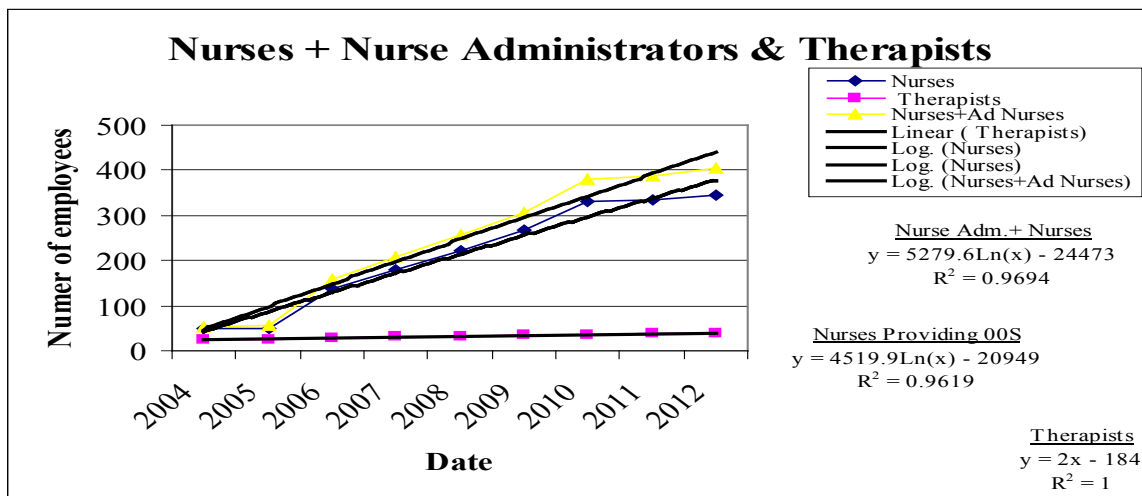


Figure 3. Nurses plus Administrators and Therapists.

The Therapist have had a linear growth while the nurses providing occasions of service have a logarithmic increase only superseded by an even greater logarithmic growth of nurses administrators.

First Step in normalising 'information' but still not totally normalised is to

return to the aged population. Firstly, normalise the data for statistical analysis, by dividing the number of nurses into the age population actually served, yielding the number of aged persons serviced by each of nurse.

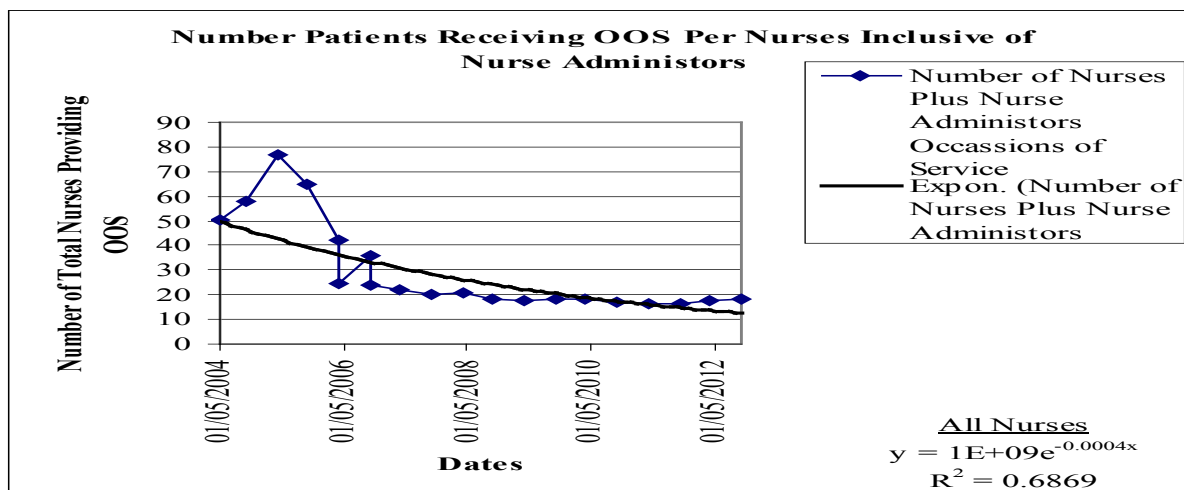


Figure 4. All Nurses providing OOS to Aged Patients

Figure four demonstrates and exponential drop in the number of aged patients visited per nurse for the last seven years, a measure of productivity.

The next step in normalising ‘information’ into Statistical Data, non-compromised information or greatly reduced vested data acquisition. The last step in normalising the occasions of service of the nurses and therapists is to determine the cost for each of the occasions of service. The median wages for: nurses, nurse administrators, and therapist yield a final common normalised data for statistical analysis.

The data can now be statistically analyses; all the unit measurements for the occasions of service are equivalent.

Table 3. The cost per aged patient for nursing and therapist

Date	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>
Total									
\$N/Patient	756.23	738.02	59.72	522.22	818.72	942.43	283.93	553.53	262.3

Table 4. Statistical results on normalized data using a nonparametric

test, Friedman.

N	9
Chi-Square	14.889
df	2
Asymp. Sig.	.001

Discussion.

Calculating productivity can be a very effective means of depicting performance of any organisation including government health services. However, first principles must be upheld in order to obtain an accurate depiction of productivity (8,9,10). Obtaining the data used to calculate productivity, both the output and the input, needs to be acquired by non-vested parties [7]. Secondly, by normalising the data, thereby reducing that data to its lowest commonality for comparison to other departments or organisations. Statistical tests determine if productivity has changed either raised or has lowered. Normalisation of data is an imperative to obtain a reliable and hence valid indication of performance. The method outlined and demonstrated in this paper of the measurement of productivity can be applied: to an entire government service sector in this case one region in NSW; to a particular subcategory within particular service sector (community health); and, to targeted professions within a service sector [11,12,13,14]. Paul Krugman (1996) was very articulate about the virtues of productivity, 'productivity isn't everything, but in the long run it is almost everything. A country's ability to improve its standard of living over time depends almost entirely on its ability to raise its productivity [4]. The productivity within the NSW health system has been significantly and substantially decreasing for over ten years with consequential effects. Social infrastructure is left wanting, now age pensions are mooted to decrease, and taxes to raise. Rober Solow's 1987 quip, "You can see the information age everywhere but in the productivity statistics [15]" 'Productivity paradox' simply refers to the simple correlation as more money is spent productivity goes down, as demonstrated in this study.

Conclusion.

This study has found a statistically significant decrease in productivity within the a New South Wales health system from 2004 to 2012, a

decreased of 300%. "However, only by understanding the causes of the "productivity paradox", we can learn how to identify and remove the obstacles to higher productivity growth [17]".

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