AIRAH
HVAC&R FOR A BETTER WORLD

The case for preventive investment in indoor air quality

Australia invests billions of dollars ensuring the quality of the food we eat and the water we drink. So why don't we have a reliable system in place for safeguarding the quality of the air we breathe indoors, where we spend more than 90% of our time and where we breathe tens of thousands of times every day?

An abundance of research suggests that implementing a range of targeted measures to improve indoor air quality (IAQ) can also improve quality of life. We can reduce the transmission of airborne infectious diseases, boost cognition, and ultimately improve overall health and lead more productive lives. This is particularly important in the health and aged care sectors; those receiving care are often among the most immunocompromised and vulnerable members of our community.

Introducing national operation standards for air quality in buildings, improving ventilation systems, and educating the public about the benefits of good IAQ is vital for safeguarding all Australians and improving their health outcomes. It will also reduce the demand for future care services.

Quantifying the impacts of dirty air

In 1998, the CSIRO estimated the cost of poor IAQ in Australia at $12 billion per year – equivalent to $24 billion in today's money. When accounting for the impact of emerging and recent diseases such as COVID-19 and fungal pathogens, this figure is significantly higher.

More than 10 times the number of people were hospitalised and an equal proportion died last year from COVID in Australia than from flu. According to a recent study, long COVID alone cost the Australian economy almost $10 billion in 2022 due to declining labour supply and reduction in other production factors. New estimates that include both COVID and long COVID indicate a 1.9% reduction in labour supply, equating to a $20 billion loss in labour value-added alone, or roughly a $39 billion reduction in GDP, assuming a proportional decrease in other factors.

A report produced by the Facilities Management Association of New Zealand analysed the economic benefit and cost of upgrading buildings to reduce sickness and improve focus of building occupants. It found that health benefits alone would justify the investment, with a benefit-cost ratio (BCR) of between 1 and 2.3. Including productivity would increase the BCR to between 3.4 and 4.6.

Indoor air quality in care settings

Air quality is particularly important for those we care for, both young and old. Below are some examples of care settings where investing in improved air quality will have significant preventive benefits.

Schools

In Australian school classrooms, inadequate ventilation makes it hard for students to concentrate, and they may experience headaches, drowsiness, tiredness and changes in respiratory patterns. Low ventilation rates have been linked to higher rates of absenteeism, poorer performance on academic tests, and teacher dissatisfaction. A 2023 US study published in *Environment International* found that each 1 litre per second improvement in fresh air ventilation was associated with decrease in days with absences per year of 5.59, corresponding to a 0.15% increase in the annual daily attendance rate. This research shows that preventive approach to investing in improved IAQ improves both health and learning outcomes for young people.

It should be noted that the IAQ factors that lead to these observations are complex and include impacts from bioeffluents, and of having a group of people in close proximity to each other, not just the buildup of carbon dioxide in the room.

Beyond academic performance, schools, kindergartens and daycare centres are also significant vectors for the transmission of infectious illnesses such as colds, flu, RSV and gastroenteritis, which spreads on surfaces. Children often bring these infections home, spreading them to parents, siblings and other household members, which can lead to broader community outbreaks and increased pressure on the healthcare system. Improving indoor air quality as it relates to infectious illness in these environments through better ventilation, filtration and monitoring not only supports student health and attendance but also plays a crucial role in breaking the chain of illness transmission within families and the wider population.

Aged care facilities

The COVID-19 pandemic has been a stark reminder of the increased health risks that poor management of indoor air dilution and airflow poses to elderly members of society. A 2024 study into aged care facilities found that pathogenic microbes are often present in such facilities at levels that are high enough to cause infection. This situation arises when the use of only natural ventilation (relying on open windows) is insufficient to remove those pathogens from the air quickly enough before they infect another person. A big limitation in care settings is our inability to reduce the density of people in the room who may either be infected or at significant risk. The study found that the most effective approaches to reducing airborne transmission in aged care facilities are improved ventilation design and air purification from portable filters.

Hospitals

Among the most critical sites for preventing airborne transmission by controlling particulate air quality are hospitals, where the prevalence of airborne pathogens is expected to be significant and many occupants are severely immunocompromised.

A study from Cambridge University found that well-maintained air conditioning and ventilation systems within hospitals are critical for reducing disease transmission; well-ventilated areas within hospitals show significantly lower rates of transmission than those with poor ventilation.

A pre-COVID study found that reducing indoor air pollution not only improves patient health, it also saves hospitals substantial amounts of money by preventing the spread of infectious diseases and the worsening of other health conditions.

Boosting air quality, boosting productivity

Australia does not have operational standards in place for guaranteeing a minimum level for any of the diverse IAQ pollutants in a building. The first step to doing this is to convene a multi-disciplinary expert panel to put a plan in place, with government support. Improving ventilation and air control systems will be a key part of the solution. Thankfully, we already have much of the technology and engineering required, including standards from abroad that could be adapted to suit Australia's needs.

We must also educate people about the relevance of IAQ to health, and how they can play a part. Just one example of this is reducing airborne and other infection spread by encouraging people to stay away from shared spaces when they are sick. However, they also need to understand that high quality indoor air is more than just preventing infection spread. For example, following protocols established for thermal comfort based on humidity control plays a major role in breathing more safely, as air that is too dry increases risk of catching an infection while high moisture can lead to dampness and mould, and increase the change of life-threatening secondary infections.

The evidence is clear: investing in improved IAQ in care settings is an achievable and economically viable way to prevent the spread of diseases, reduce financial burden on the healthcare system, and achieve better outcomes for the most vulnerable Australians. The AIRAH membership is a diverse group of scientists, engineers and HVAC specialists, and we are certain we have the smarts and the smart systems in Australia to make this change.

Productivity benefits for industry

Committing to improving indoor air quality will have a knock-on effect on Australian businesses that evaluate, improve and design ventilation systems. Similarly, demand will increase for products such as filters, air purifiers, and UV lights, providing opportunities for Australian manufacturers to develop products for the local market, and potentially to export them.

About AIRAH

As a leading industry body representing professionals in the heating, ventilation, air conditioning and refrigeration industry, AIRAH is ideally positioned to participate in such an initiative by contributing the expertise and experience of our expert members. We are driving conversation and building knowledge in this space through our events on IAQ, and by developing technical resources and training to help lift the quality of air in our buildings.

We see improving IAQ as a huge, untapped opportunity to boost preventive care in Australia and improve outcomes for those who are most vulnerable.