

How Can the Threat of New and Emerging Infectious Diseases be Reduced?

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Overview of Australia's State of Health

Australia is one of the healthiest nations as measured by life expectancy. Australia's life expectancy at birth continues to rise and is almost 84 years for females and 79 years for males.¹ At age 65, males can expect to live to 84 years and females to 89 years. This ageing of the society brings with it its own challenges, particularly in the way those with chronic disease are cared for. Hence, the main focus for healthcare providers is on chronic disease, both its management and prevention. Nonetheless, infectious disease is still important, particularly emerging infectious diseases (EIDs), because although the risks of contracting an EID are lower than contracting a chronic disease the potential impact could be enormous. This report will provide a brief but broad overview of the general state of Australia's health, including especially chronic disease, followed by a special emphasis on infectious diseases and biosecurity.

A snapshot of Australia's health in 2010 has been summarised by the Australian Institute of Health and Welfare (AIHW) as follows:

Life expectancy and death

- Death rates are falling for many of our major health problems such as cancer, cardiovascular disease, chronic obstructive pulmonary disease, asthma and injuries.
- Coronary heart disease causes the largest number of 'lost years' through death among males aged under 75 years, and breast cancer causes the most among females.

Diseases

- Cancer is Australia's leading broad cause of disease burden (19% of the total), followed by cardiovascular disease (16%) and mental disorders (13%). Deaths due to infectious disease are 1% of all causes.
- The rate of heart attacks continues to fall, and survival from them continues to improve.
- Around 1 in 5 Australians aged 16–85 years has a mental disorder at some time in a 12-month period, including 1 in 4 of those aged 16–24 years.
- The burden of Type 2 diabetes is increasing and it is expected to become the leading cause of disease burden by 2023.
- The incidence of treated end-stage kidney disease is increasing, with diabetes as the main cause.

Health risks

- Risk factors contribute to over 30% of Australia's total burden of death, disease and disability.
- Tobacco smoking is the single most preventable cause of ill health and death in Australia.
- However, Australia's level of smoking continues to fall and is among the lowest for OECD countries, with a daily smoking rate of about 1 in 6 adults in 2007.
- Three in 5 adults (61%) were either overweight or obese in 2007–08.
- One in 4 children (25%) aged 5–17 years were overweight or obese in 2007–08.
- Of Australians aged 15–74 years in 2006–2007, less than half (41%) had an adequate or better level of health literacy.
- Rates of sexually transmissible infections continue to increase, particularly among young people.
- Use of illicit drugs has generally declined in Australia, including the use of methamphetamines (the drug group that includes 'ice').

Life stages

Mothers and babies

- The proportion of females having caesarean sections has continued to increase over the latest decade, from 21% in 1998 to 31% in 2007.
- The perinatal death rate of babies born to Indigenous mothers in 2007 was twice that of other babies.

Children and young Australians

- Death rates among children and young people halved in the two decades to 2007, largely due to fewer deaths from transport accidents.
- More children are being vaccinated against major preventable childhood diseases, with 91% (the target level) being fully vaccinated at 2 years of age—but only 82% of 5 year olds are covered.
- Land transport accidents and intentional self-harm accounted for 2 in every 5 deaths (42%) among young Australians (aged 15–24 years) in 2007.

People aged 25–64 years

- The main causes of death in this age group in 2007 were coronary heart disease for males (14% of their deaths) and breast cancer for females (12%).

Older Australians

- For older people, the main causes of death are heart disease, stroke and cancer.
- At age 65, Australian males can now expect to live a further 19 years to almost 84 years of age, and females a further 22 years to almost 87.

Groups of special interest

- People with disability are more likely than others to have poor physical and mental health, and higher rates of risk factors such as smoking and overweight.
- Compared with those who have social and economic advantages, disadvantaged Australians are more likely to have shorter lives.
- Indigenous people are generally less healthy than other Australians, die at much younger ages, and have more disability and a lower quality of life.
- People living in rural and remote areas tend to have higher levels of disease risk factors and illness than those in major cities.
- Compared with the general community, prisoners have significantly worse health, with generally higher levels of diseases, mental illness and illicit drug use than Australians overall.
- Most migrants enjoy health that is equal to or better than that of the Australian-born population—often with lower rates of death, mental illness and disease risk factors.

Infectious Disease and Biosecurity

As can be seen from the foregoing, chronic disease is the major disease burden for Australia. However, the burden of infectious diseases is not insignificant in Australia: infections and immunisations account for about 7% of all GP consultations² and approximately 3–4% of deaths annually are attributed to infection.³ Of the notifiable diseases, those with highest incidence are Chlamydia, influenza (laboratory confirmed), pertussis (whooping cough) and campylobacteriosis. Deaths due to infectious disease are approximately only 1% of all causes and the burden of disease is 1.7%. There is a link between infectious diseases and chronic disease. For example, Chlamydia infections can lead to reactive arthritis, group A Streptococcal infections to rheumatic heart disease, human papilloma virus to cervical cancer and Hepatitis C to liver cancer.

Of great concern is the potential for an EID to appear that has high mortality and is highly infectious. As approximately 70% of newly emerging human diseases over the last 30 years have come from animals, by definition termed zoonotic diseases, Australia's efforts in prevention and early detection of EIDs are linked with animal health in the general area of biosecurity. While there are many agencies involved in various aspects of biosecurity, there is no nationally co-ordinated, cross-sectoral (public health, agriculture, environment) approach to the field of biosecurity research or the development and the translation of research outputs into prevention practices. As a result of concerns about the risk of entry by H5N1 Avian Influenza, there has been increased interaction between agencies in human health and animal health that have led to protocols for an integrated emergency response to zoonotic diseases. But there is an ongoing need for cooperation and collaboration at all levels of biosecurity.

Nonetheless, various segments of the Australian community recognise the importance of a cross-sectoral approach as evidenced by the First International One Health Congress taking place in Melbourne in February, 2011. This conference highlighted the importance of having a holistic understanding of the interrelated fields of human health, animal health and environmental health (including wildlife) and the way that changes in one of these areas can have impact on the others. For example, changes in land management such as land clearing can result in farm animals or birds coming into closer contact with wildlife populations leading to infectious diseases

emerging from a wildlife species into domestic livestock with the added potential to be further transmitted to humans. From the perspective of human health there are two main areas where partnership and co-ordination are especially required.

a. Zoonotic diseases

This is a broad field and requires co-ordination between wildlife management, animal health and human health. Examples of known zoonotic diseases include: H5N1 influenza, pandemic H1N1 influenza, Rabies, Henipa viruses (including Hendra and Nipah), Rift Valley Fever, West Nile Virus, Murray Valley Encephalitis and Japanese Encephalitis.

Beyond the risk from farmed livestock, companion animals such as dogs, cats, birds and a variety of other animals provide an opportunity for infectious agents to infect humans, somewhat exacerbated by the global trend for more exotic species. For example, in 2003 in the USA, the infection of humans by monkey pox came from imported Gambian giant rats via prairie dogs that had come into contact in a pet distribution centre.

Horses can pose a particular and significant risk for the transmission of disease to humans. Horses have close contact with humans and they travel widely both nationally and internationally. The Hendra virus, although found in bats, is an example of an EID that was transmitted to humans via horses with the first known fatal case occurring in Brisbane in 1994. At the time of writing there are reports of a high incidence of unusually severe neurological disease in horses following a period of extensive flooding in many parts of Australia. It is possible this disease could be caused by Kunjin virus infection in South Australia and New South Wales. Horses in Victoria are more probably infected with Murray Valley Encephalitis virus. Importantly though, infection of horses with these agents is unlikely to lead to an infection in humans due to the viremia in horses being too low for mosquito transmission. Studies have shown that infections in humans from these agents usually arise from transmissions from species of wild birds e.g. herons by mosquitoes. Currently sentinel chickens have been shown to be infected raising this possibility of an increased risk to humans at this time.

b. Invasive species

Australia has a unique and fairly isolated natural flora and fauna. Exotic invasive animal, bird, reptile, fish and insect species not only can lead to the breakdown in the balance of the natural environment that leads to greater opportunities for disease transmission but also can be direct carriers of exotic infectious diseases. Not only does this threaten our native wildlife species but there is the very real risk that these diseases will jump the species barrier and infect our domestic livestock and even humans. Hence, work in biosecurity including quarantine measures and off-shore surveillance in partnership with neighbouring countries although often justified on an environmental or agricultural basis, also has great value for human health.

The case for a comprehensive, international, One Health approach to biosecurity is compelling but requires new partnerships between local, state, national and international agencies, organisations and private companies. Internationally, there is strong support for the One World, One Health (OWOH) approach including from regional and national bodies in Asia. There is now a general realisation that the lessons from responding to influenza outbreaks have much broader application and that an

ecosystem approach to health is required. Such ecosystems are not bounded by political or national boundaries highlighting the need for broad international co-operation and collaboration. An International Ministerial Conference on Avian Influenza in October 2008 in Egypt identified six strategic foci for reducing risks of infectious diseases at the animal-human-ecosystems interface⁴:

- Initiating more preventive action by dealing with the root causes and drivers of infectious diseases, particularly at the animal–human–ecosystems interface.
- Building more robust public and animal health systems that are based on good governance and are compliant with the International Health Regulations (IHR) 2005 (WHO, 2005) and OIE international standards, with a shift from short-term to long-term intervention.
- Strengthening the national and international emergency response capabilities to prevent and control disease outbreaks before they develop into regional and international crises.
- Better addressing the concerns of the poor by shifting focus from developed to developing economies, from potential to actual disease problems, and to the drivers of a broader range of locally important diseases.
- Promoting wide-ranging institutional collaboration across sectors and disciplines.
- Conducting strategic research to enable targeted disease control programmes.

It is the implementation of these strategic principles that is an on-going challenge. While Australia has significant capability broadly in infectious disease its main challenge is to co-ordinate more effectively this capability in both prevention and response. Australia also has a role and an opportunity to work with its Asian neighbours in capacity building. A review by the National University of Singapore and commissioned by AusAID, demonstrated limited local capacity for research on EIDs in SE Asian countries.⁵ The priorities for such international co-operation include predicting high risk areas through modelling especially in relation to biodiversity and climate change, identifying hotspots for the emergence of zoonotic diseases, building local capacity to carry out biosecurity research, especially the ability to diagnose EIDs, and building a network of partnerships with research funders and providers.

The biosecurity community is changing the paradigm from reaction to prevention. Previously the focus was on identifying an event (i.e. sickness), being able to rapidly detect the probable cause of the event, confirmation of the diagnosis of the cause followed by response, i.e. event-detection-confirmation-response. The model being proposed and implemented by groups such as the USAID is prediction-response-prevention-identification, where prediction involves a combination of field surveillance studies, remote sensing, laboratory analysis and probabilistic modeling. The effort required to implement this new paradigm will take a strong commitment from leaders because it will involve behavioural change (both individual and institutional), advocacy and extensive collaboration, to name just a few.

Health of Indigenous Australians

A special mention should be made of indigenous Australians because there are major initiatives underway to tackle the health disadvantage that many indigenous people experience. As mentioned above indigenous people are generally less healthy

than other Australians, die at much younger ages, and have more disability and a lower quality of life.

There are approximately 550,000 indigenous Australians representing 2.5% of the population of Australia and contrary to popular expectation 76% live in major cities or non-remote areas. Life expectancy for indigenous people is 67 years (males) and 73 years (females). The burden of disease and hospitalisation rate is 2.5 times that of non-indigenous people and mortality rate is almost twice that of the rest of the population.

Cardiovascular disease is the leading cause of mortality (27%) followed by cancer (17%), injuries (15%), respiratory disease and diabetes (both 8%). All these conditions contribute significantly to the burden of disease as do mental disorders (16%).

A particular issue for indigenous Australians is the high incidence of rheumatic heart disease, an infectious disease caused by Group A streptococcal infections. It is one of the major killers of indigenous children but is virtually unheard of in non-indigenous communities.

Another major health problem is Type 2 diabetes which occurs at a rate amongst indigenous people of 3-5 times (depending on age) that of non-indigenous people. This disease results in raised levels of chronic kidney disease. Mortality from chronic kidney disease is 5 times that of non-indigenous Australians.

Infant mortality is also higher in indigenous communities being 10.3 per 1000 live births compared to 4.2 per 1000 for non-indigenous infants.

Indigenous disadvantage in health is the result of a complex mix of historical, social, economic and cultural factors that are beyond the scope of this paper. The most recent response of Australian governments recognises this complexity as targets have been set for outcomes in education and employment in addition to health, due to their interrelatedness.

The National Indigenous Reform Agreement (NIRA) of 2008 signifies the importance all governments place on Closing the Gap in indigenous disadvantage.⁶ While not separately funded, the NIRA is underpinned by five funded National Specific Purpose Payments in the areas of health, schools, skills and workforce development, housing and disabilities. The six COAG Closing the Gap targets are:

- to close the gap in life expectancy within a generation;
- to halve the gap in mortality rates for Indigenous children under five within a decade;
- to ensure all Indigenous four-year olds in remote communities have access to early childhood education within five years;
- to halve the gap in reading, writing and numeracy achievements for Indigenous children within a decade;
- to halve the gap for Indigenous students in year 12 equivalent attainment by 2020; and
- to halve the gap in employment outcomes between Indigenous and non-Indigenous Australians within a decade.

As part of its National Preventative Health Strategy, the Australian government is in the process of implementing a variety of actions focusing on tobacco, alcohol and obesity. Tom Calma was appointed national Co-ordinator for Tackling Indigenous Smoking in February, 2010, and a variety of other actions have been initiated. It is too

early to evaluate the impact of these programs.

Health Reform

Health has become a major topical and political issue over the last two years. The national government is leading efforts to bring about reform in healthcare and in the promotion of wellbeing. There have been several reviews and, through the Council of Australian Governments (COAG), basic principles for the renewal of Health Care Agreements between the Commonwealth and States and Territories have been agreed.⁷ viz: “Australia’s health systems should:

- be shaped around the health needs of individual patients, their families and communities;
- focus on the prevention of disease and injury and the maintenance of health, not simply the treatment of illness;
- support an integrated approach to the promotion of healthy lifestyles, prevention of illness and injury, and diagnosis and treatment of illness across the continuum of care; and
- provide all Australians with timely access to quality health services based on their needs, not ability to pay, regardless of where they live in the country.”

An account of the reform process is a paper in its own right and is outside the scope of this report.

Conclusion

While the health of Australians is relatively high, major challenges remain:

- the need to move to prevention of the major chronic diseases such as cardiovascular disease and diabetes, for all Australians and particularly for and with indigenous communities
- implementation of the healthcare reform process with emphasis on patient-centric systems, integration, promotion of healthy lifestyles and equity
- the need to improve the national and international co-ordination of efforts by agencies, organisations and private companies involved in biosecurity in order to prevent the spread of known or emergence of previously unknown infectious diseases
- the need to fully embrace a One Health approach through the development of a health ecosystems understanding of infectious disease and by promoting the much closer interaction of the traditional fields of animal health, human health and environmental health
- the need to move to a prevention approach based on prediction for the control of EIDs

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Notes

- 1 This statistic and many others quoted in this article are provided by the Australian Institute of Health and Welfare in their report "Australia's Health 2010". AIHW 2010. Cat. no. AUS 122. Canberra: AIHW. See <http://www.aihw.gov.au/publication-detail/?id=6442468376>
- 2 Britt H, Miller GC, Knox S et al. 2005. General practice activity in Australia 2004–05. AIHW Cat. no. GEP 18. Canberra: AIHW. Viewed 3 September 2009, <<http://www.aihw.gov.au/publications/index.cfm/title/10661>>
- 3 GRIM (General Record of Incidence of Mortality) books. Canberra: AIHW, 2009.
- 4 Contributing to One World, One Health - A Strategic Framework for Reducing Risks of Infectious Diseases at the Animal-Human-Ecosystems Interface (2008). Produced by FAO, OIE, WHO, UN System Influenza Coordination, UNICEF and WORLD BANK, See <http://www.fao.org/docrep/011/aj137e/aj137e00.htm>
- 5 Wilder-Smith A LV, Lim Meng Kin, Wilcox B, Gubler D, Ooi Eng Eong, Phua Kai Jong. Emerging Infectious Disease in the Asia-Pacific Region: From Transdisciplinary issues to Policy making and Programming: A Research Analysis. Singapore: National University of Singapore; 2008.
- 6 COAG Fact Sheet "National Indigenous Reform Agreement". http://www.coag.gov.au/coag_meeting_outcomes/2008-11_29/docs/20081129_national_indigenous_reform_factsheet.rtf
- 7 COAG's Intergovernmental Agreement on Federal Financial Relations (IGA), http://www.coag.gov.au/intergov_agreements/federal_financial_relations/index.cfm