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PREPARING FOR THE INEVITABLE—AN INFLUENZA PANDEMIC

GUEST EDITORIAL

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The world is currently at ‘Global Phase 3’ of the World Health Organization’s influenza pandemic alert phases, where human disease due to a novel strain of influenza is occurring, but there is no good evidence of human-to-human transmission. Given the instability of the influenza virus, the world is waiting for the first influenza pandemic of the twenty-first century. It is thus timely to consider the threat of the next influenza pandemic, the means for combating it and our readiness to deploy these measures.

Pandemics with symptoms resembling influenza have been recorded regularly over the past four centuries. In the past 175 years there have been seven well documented influenza pandemics, with onsets in 1833, 1836, 1847, 1889, 1918, 1957 and 1968: a pandemic occurring, on average, every 23 years. The longest period between recorded pandemics was 42 years; it is now 38 years since the last influenza pandemic.

A unique convergence of factors demands that we prepare for a pandemic.[1] There has not been an avian influenza strain in living memory as pathogenic in birds as H5N1, which is causing unprecedented mortality amongst poultry in Asia. Outbreaks in poultry have not been restricted to South East Asia but have spread into the Middle East, Indian sub-continent, Europe and Africa. In people with confirmed avian influenza H5N1 infection, the mortality rate approaches 60 per cent. The massive increase in high intensity poultry farming globally continues. The world population has tripled since the 1918 pandemic and there has been a dramatic increase in the number of crowded megacities (with populations exceeding 10 million people) in Asia, Africa and Latin America. International air travel has greatly increased the likelihood of rapid

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global spread of respiratory illnesses that have relatively short incubation periods. Meanwhile, across the world, there are fewer hospital beds per capita now than there were in 1968.[2]

In October 2006, Australia's health and emergency services participated in Exercise Cumpston 06, the largest health simulation exercise ever held in this country, to test our preparedness to respond to and contain an influenza pandemic. In late 2005, Exercise Eleusis employed a hypothetical scenario to test how well departments of agriculture and health, across all levels of Australian government, could work with industry to identify, contain and eradicate avian influenza. These investments in planning and preparedness reflect a recognition of the enormous health, social and economic consequences that might result from an inadequate response to an avian influenza outbreak in Australia or to the next influenza pandemic.

Given the public health importance of avian and pandemic influenza, two issues of the *NSW Public Health Bulletin* have been devoted to this topic. They will provide a ready reference to current knowledge and policy approaches. However, the pandemic influenza policy environment is dynamic and will continue to evolve, due both to changes in influenza epidemiology and to lessons learnt from exercising our responses. This first issue provides an historical context to a future influenza pandemic and considers the likelihood of an avian influenza outbreak in Australia. It also explores the responsibilities of various tiers of government in responding to a pandemic threat.

The issue opens with an article by Black and Armstrong, 'An introduction to avian and pandemic influenza', that explores the instability of influenza viruses, and how these viruses drift and shift to their survival advantage. The paper distinguishes between seasonal, avian and pandemic influenza and reminds us that the H5N1 avian influenza virus causing outbreaks in poultry flocks across the world meets two of the three prerequisites for a pandemic virus: a novel influenza strain and a virus with the ability to replicate in humans and cause serious illness.

Curson and McCracken, in 'The impact of the 1918–1919 influenza pandemic—Australian perspectives', provide a graphic description of the 1918–1919 pandemic and its impact in NSW. An influenza pandemic with a relatively high fatality rate would have a profound impact on society well beyond traditional health boundaries.[3] This article provides a stark reminder that a well-informed media and general public are essential to an effective response.

Arzey's paper, 'The risk of avian influenza in birds in Australia', describes avian influenza and the five recorded outbreaks of highly pathogenic avian influenza that occurred in Australia between 1788 and 2006. These were controlled rapidly and effectively. Arzey discusses the risk of avian influenza H5N1 occurring in Australia, and the risk currently appears to be low.

In 'Commonwealth pandemic preparedness plans' Australia's Chief Medical Officer, John Horvath, emphasises the challenge facing all nations that wish to be fully prepared for an influenza pandemic. He catalogues the broad range of measures already taken by the Australian government to ensure readiness. Australia's commitment to an Asian-Pacific regional partnership for responding to this threat deserves particular mention. Although there are both sound altruistic and moral imperatives for this approach, containment of a pandemic outside Australia's borders is clearly a desirable goal in reducing the risk of the pandemic spreading to this country.[4] The Australian Department of Health and Ageing also has an important role in ensuring a well-coordinated and standardised approach across States and Territories.[5] Horvath confirms the importance of exercises for testing systems and modifying plans on the basis of lessons learned.

Armstrong and Chant, in 'Preparing for the next influenza pandemic: A New South Wales perspective', remind us that the investment made in pandemic planning will stand us in good stead for other emerging infectious disease threats. They introduce the *NSW Health Interim Influenza Pandemic Action Plan* and place it in context within the hierarchy of other plans, particularly those of the World Health Organization and the Australian Government.

What is expected from a public health unit in responding to this threat? Recent disease modelling suggests that a massive public health effort may greatly attenuate a pandemic. Eastwood and colleagues, in 'Pandemic planning at the coal face: Responsibilities of the public health unit', address the complex set of challenges at local level.

It is essential therefore that we plan, prepare and practice now. As Dr Nabarro, the Representative of the Director for Health Action in Crises, World Health Organization, stated in December 2005, 'the pandemic could start tomorrow. By the time the pandemic starts, preparation will be too late'.[6] The papers in this and the following issue of the *NSW Public Health Bulletin* indicate that while much remains to be done, preparations are well underway.

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AN INTRODUCTION TO AVIAN AND PANDEMIC INFLUENZA

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ABSTRACT

There are many types of influenza viruses, which cause illness in a variety of birds and mammals. New strains are constantly evolving, causing seasonal influenza epidemics in humans. This article provides information about influenza and influenza viruses, and the three influenza pandemics of the twentieth century. Pandemic influenza is differentiated from avian influenza, which is a viral disease that primarily infects birds. The current outbreak of avian influenza H5N1 in poultry flocks across the world is unprecedented in its spread. Human infection with avian influenza is rare and for most strains the symptoms are usually mild. A notable exception is HN51, where almost 60 per cent of the currently recorded 251 human cases have died. While the risk of a pandemic occurring in the current circumstances is unknown, there is a high level of concern worldwide.

Humans can be infected by seasonal influenza, pandemic influenza, and on rare occasions, avian influenza. These forms of influenza and the risk of acquiring them are often confused—especially in the current circumstances of avian influenza outbreaks in poultry flocks around the world, human cases of avian influenza, and growing concerns about the next influenza pandemic. A clear understanding of these terms dispels confusion, and enables readers to engage effectively with the large amount of information about them in the scientific literature and the media.

INFLUENZA

Influenza is a viral disease characterised by the rapid onset of fever, myalgia, headaches, sore throat and cough.[1] Symptoms usually resolve within a week, however, complications such as pneumonia, respiratory failure, heart failure and death can occasionally occur, most often in the chronically ill, the elderly, or in young children. The virus is spread by inhalation of infectious droplets that are sneezed or coughed into the air, or by direct contact with surfaces that are contaminated with infected droplets.[2] There is some evidence that the virus may also be spread by small aerosolised particles.[3]

There are three types of influenza viruses, designated A, B and C. Influenza A viruses have several subtypes and are named according to the two key glycoproteins on their surface, hemagglutinin (H) and neuraminidase (N) - for example H1N1, H3N2. The evolutionary hosts for influenza viruses are aquatic birds and all subtypes of influenza A viruses infect birds. Some subtypes of influenza A also infect pigs, horses, sea mammals and humans.[1] Influenza A viruses tend to be specific to their host species because the hemagglutinin and other viral proteins are specific to particular receptor cells in the host organism, however, on rare occasions, viruses from one species will infect other species. Influenza B and C viruses are essentially unique to humans.

Antigenic drift and shift

A notable feature of influenza A viruses is their propensity for genetic change, which occurs by two main processes: antigenic drift and antigenic shift. Minor variations continually occur in the virus when small errors go uncorrected during replication. This process is called antigenic drift. Over time, the minor changes accumulate, creating a virus that eventually becomes foreign to the immune system. This keeps human populations susceptible to infection, leading to outbreaks of influenza each year; hence the constant need for the reformulation of influenza vaccines.[1]

Antigenic shift refers to the evolution of a new subtype of influenza A that is completely unfamiliar to the immune system. This can occur through a re-assortment process when two different viruses co-infecting the same host cell exchange gene segments, creating a new virus subtype. If the new virus contains the right mix of genes, a mix that allows it to cause severe disease and be easily transmitted between humans, it has the potential to cause a pandemic.[4] Evidence suggests that a recombination of bird and human influenza viruses created the influenza viruses responsible for the 1957–1958 and 1968–1969 human pandemics.[5,6] These viruses have genetic components from both human and avian influenza viruses.

Until recently it was believed that the H1N1 influenza virus of the 1918–1919 pandemic also developed through the re-assortment process. However, recent scientific studies indicate that all eight genes of the 1918 influenza virus were derived from avian influenza genetic material[7,8], suggesting that the virus probably developed by infecting humans and adapting directly.

INFLUENZA PANDEMICS

Influenza pandemics are unpredictable events that occur when a new influenza A virus strain spreads rapidly throughout the world, affecting large numbers of susceptible people simultaneously. Accurate records of influenza pandemics since the 16th century are available and these show that pandemics tend to occur three or four times each century.[4,9,10] The impact of pandemics can be variable, although they are all associated with excess morbidity and mortality and can lead to social and economic disruption. They generally manifest in two or three waves of illness within the community, and they can occur at any time of year[9], rather than conforming to the usual seasonal pattern for late winter.

There were three influenza pandemics in the 20th century, informally identified by the country where they were thought to have originated (although this information was not necessarily accurate). Table 1 provides a comparison between the characteristics of these pandemics and those of seasonal human influenza epidemics.

The 1918 pandemic was notorious for the exceptional severity of illness and the striking age shift in influenza mortality. It is described further in the article by Curson and McCracken in this issue of the *Bulletin*. One third of the world's population were estimated to have developed clinically apparent infection, with a case fatality rate of around 2.5 per cent.[9] In NSW, 37 per cent of the population were estimated to have been infected, with a case fatality rate of 1.3 per cent.[15] The mortality pattern for this pandemic was different from seasonal influenza epidemics in that mortality rates were greatest in persons aged under 65 years rather than those aged over 65 years. Sixty per cent of the excess deaths in Australia were in healthy adults aged 20–45 years[4] (excess deaths are the estimated number of deaths that occur above a baseline of deaths that would be expected in the absence of an influenza epidemic). While this age shift in mortality also occurred in the influenza pandemics of 1957–1958 and 1968–1969, with 34 to 41 per cent of excess deaths in persons aged under 65 years, the estimated excess mortality rates for those under 65 years of age did not ever exceed those for persons aged 65 years and over.[14]

AVIAN INFLUENZA

Avian influenza or 'bird flu' is a disease of birds caused by influenza A, which principally occurs in wild birds, most commonly aquatic birds. All birds are thought to be susceptible to influenza viruses; however, the effects differ according to the pathogenicity of the virus and the bird species infected.[4,16] Most strains of avian influenza are classified as low pathogenic as they cause little or no clinical signs in infected birds. The highly pathogenic form of avian influenza was first recognised in domestic poultry more than 100 years ago (it was known as 'fowl plague') but was not discovered to be due to influenza A until 1955. Outbreaks have been recorded in domestic bird flocks across the world.[16] More detail about avian influenza in birds is provided by Arzey in 'The risk of avian influenza in birds in Australia' in this issue of the *Bulletin*.

The current outbreak of avian influenza H5N1 (hereafter also referred to as H5N1) in domestic bird flocks and wild birds on three continents is unprecedented in its geographical spread. The strain first appeared in poultry in southern China in 1996. At the end of 2003 it caused outbreaks of influenza in poultry in the Republic of Korea, and then quickly spread to other Asian countries and most recently to Europe and Northern Africa. It is classified as highly pathogenic and has caused high rates of mortality in some bird species such as chickens, where up to 100 per cent of flocks have died within 48 hours.[4]

Human infection with avian influenza

Human infection with avian influenza viruses is rare. Prior to the resurgence of avian influenza H5N1 in December 2003, there were less than 120 cases recorded worldwide, caused by a variety of different avian influenza viruses. Figure 1 outlines the timeline for human cases of infection with avian influenza viruses.

The first human cases of avian influenza H5N1 were recorded in the Hong Kong Special Administrative Region of China in 1997 and were associated with the outbreaks of avian influenza caused by the same virus in Hong Kong poultry farms and in live markets.[4] In response to this, the entire poultry population of the Hong Kong Special Administrative Region of China was destroyed within three days, removing opportunities for further human exposure at that time. In February 2003, the virus caused illness in two people from the Hong Kong Special Administrative Region of China (one of whom died), who had recently travelled to China. Following this, in late 2003, human cases of H5N1 were recorded in Vietnam, and in 2004 inVietnam and Thailand. As of 28 September 2006, human cases have now also been recorded in Azerbaijan, Cambodia, China, Djibouti, Egypt, Indonesia, Iraq and Turkey.[19] The number of human cases continues to rise, with the majority in recent months being reported from Indonesia.

Almost all of the currently recorded 251 human cases of avian influenza H5N1 have reported close contact with diseased flocks.[18,21] Infection is caught through direct contact with infectious secretions, blood and excreta from infected birds or contaminated poultry products.[18] Playing with poultry, plucking and preparing diseased birds, handling fighting cocks, and the consumption of raw duck blood have all been implicated.[18,21] It is notable that despite widespread exposure to infected poultry, the frequency of this illness in humans has been relatively low, indicating that the virus is not easily transmitted from birds to humans.[21]

A small number of human cases are thought to have resulted from human-to-human transmission, though this mode of transmission appears to be limited and not sustained.[21] In May 2006, the largest cluster of such cases was reported when seven members of an extended family group from Northern Sumatra became infected, resulting in six deaths.[22] The risk of health care workers becoming infected from patients has been low, even when appropriate isolation measures were not used. One case of severe illness was reported in a nurse exposed to an infected patient in Vietnam.[21]

The majority of human cases of avian influenza H5N1 have occurred in healthy young adults or children.[21] The average age of the cases infected in Vietnam between December 2003 and January 2005 was 15 years, and in Thailand, 20 years.[4] The clinical spectrum of the disease (based on the description of hospitalised patients) includes symptoms typical of influenza and, in many cases, gastrointestinal symptoms such as diarrhoea and abdominal pain.[21] Almost all patients have had clinically apparent viral pneumonia, and the illness has often progressed to respiratory failure and multi-organ failure.[4,21] The fatality rate has been high, with almost 60 per cent of cases dying. There are sporadic reports of human cases of H5N1 that have no or much milder illness.[21,23] While the frequency of cases without symptoms or with milder illness associated with this virus is uncertain, serological surveys among health care contacts of patients with documented H5N1 infection have detected only very low frequencies of non-symptomatic seroposivity.[23]

TABLE 1

CHARACTERISTICS OF SEASONAL INFLUENZA EPIDEMICS AND THE THREE INFLUENZA PANDEMICS OF THE TWENTIETH CENTURY

	Influenza virus type	Estimated rates of symptomatic infection (%)	Estimated total excess deaths worldwide	Case fatality rates (%)	Mortality pattern
Seasonal influenza epidemics	Various A & B viruses	5–20*	Up to ½ million annually*	~0.001*	Excess mortality rates are 50–200 times greater in persons ≥65 years old compared with those <65 years. However, in the first 2–7 years following a pandemic, mortality rates in persons ≥65 years old may only be 2–30 times greater than those <65 years. The majority of excess deaths (more than 85%) occur among the elderly and those with high-risk medical conditions.
Spanish influenza pandemic 1918–1919	A/H1N1	20–40	>40 million	>2.5	Excess mortality rates were 3 times greater in persons <65 years old compared with persons ≥65 years old. 99% of excess deaths occurred in people <65 years. In Australia, 60% of excess deaths occurred in healthy persons 20–45 years.
Asian influenza pandemic 1957–1958	A/H2N2	10–60	2 million	0.01–0.05	Excess mortality rates were 18 times greater in persons ≥65 years compared with those <65 years. 36% of excess deaths were in persons <65 years old.
Hong Kong influenza pandemic 1968–1969	A/H3N2	25–30	1 million	0.01–0.05	Excess mortality rates were 13 times greater in persons ≥65 years compared with those <65 years. 41% of excess deaths were in persons <65 years old.

* Mortality due to seasonal influenza epidemics varies greatly depending on the predominant type/subtype of virus circulating and, for influenza A, the time since the subtype evolved in the human population.
Data sources: Mandell et al[1]; Taubenberger and Morens[9]; Department of Health and Ageing[11]; World Health Organization[4, 12,13]; and Simonsen et al.[14]

Infection of humans by other avian influenza viruses has rarely been observed and has occurred for only a limited number of known avian influenza subtypes (see Figure 1). The clinical symptoms caused by these infections are relatively mild in humans, often in the form of viral conjunctivitis, with only one recorded death.[4]

WHAT IS THE CURRENT PANDEMIC THREAT?

The current spread of avian influenza H5N1 in domestic poultry flocks and wild birds across the world, as well as the demonstrated ability of this virus to cross the species barrier and infect humans, has lead to a high level of concern that a pandemic may develop.[21]

For a pandemic to arise, three prerequisites have been identified[4]: a new virus subtype to which the population has little or no immunity must emerge; the new virus must be able to replicate in humans and cause serious illness; and the new virus must be efficiently transmitted from one human to another.

The recent human infections of avian influenza H5N1, which is a novel human pathogen, have caused severe illness and death, demonstrating that this virus meets the first two criteria. The third criteria, however, is not met as the virus has not yet demonstrated a capacity to spread easily from human to human.

It cannot be predicted whether the current H5N1 avian influenza virus will change into a form that is easily spread from human to human. There is no historical data to suggest that previous pandemics have been preceded by outbreaks of highly pathogenic influenza in domestic poultry, and avian influenza viruses are not known to cause major human epidemics of disease.[24]

Despite having no certainty about whether the H5N1 virus is now in the process of acquiring human-to-human transmissibility, the current circumstances in relation to this virus are unprecedented.[9] The outbreak of H5N1 in birds continues to expand, leading to an ever increasing number of contacts between humans and infected birds, which in turn has seen the number of human cases continue to rise. However, a number of genetic alterations in the virus will have to occur before rapid human-to-human spread of the virus is likely to occur, and the risk of this and the timing cannot be predicted.

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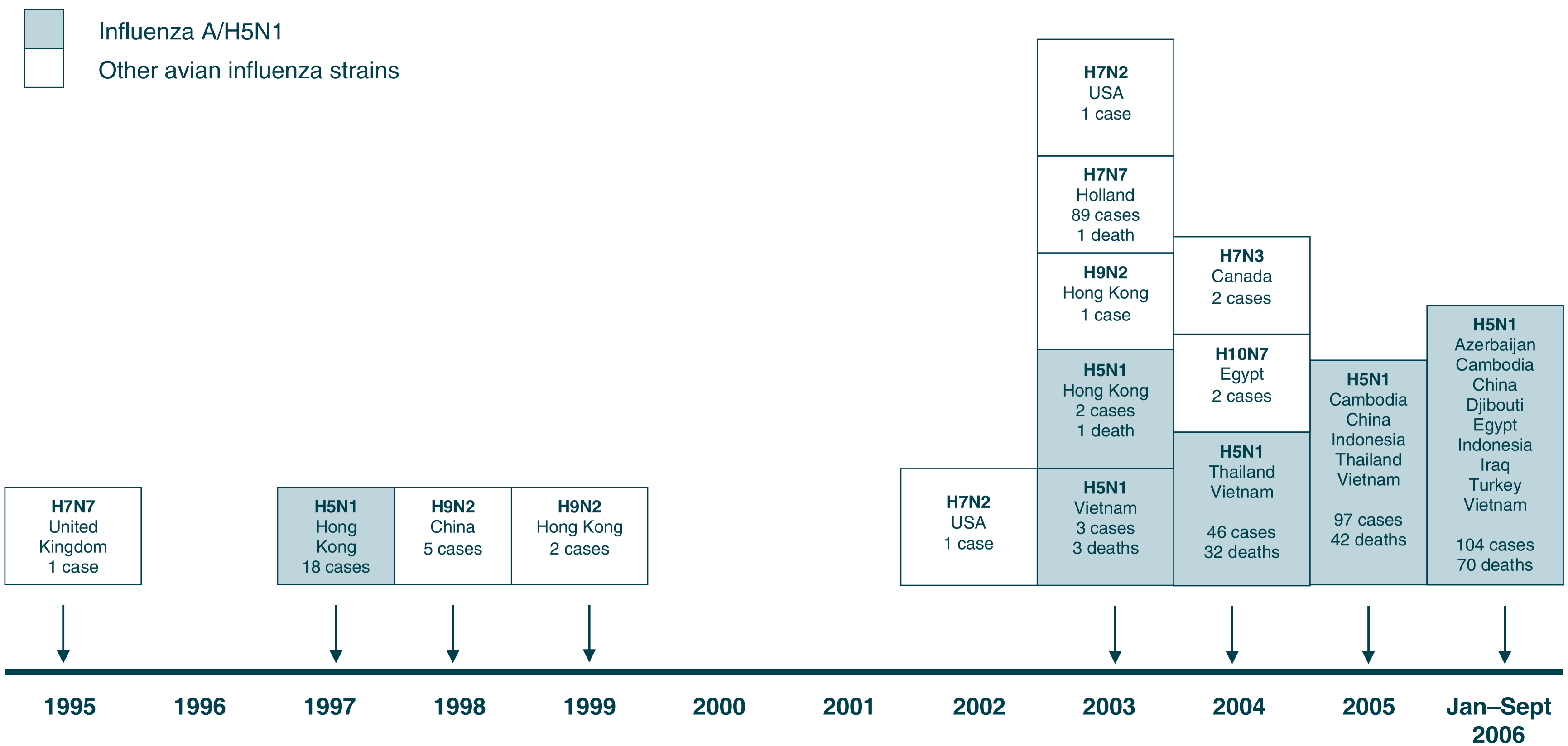
FIGURE 1

TIMELINE OF DOCUMENTED HUMAN INFECTION WITH AVIAN INFLUENZA VIRUSES, 1995 TO 28 SEPTEMBER 2006



Data sources: Fauci[17]; Wong and Yuen[18]; World Health Organization[19]; and Centers for Disease Control and Prevention.[20]

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AN AUSTRALIAN PERSPECTIVE OF THE 1918–1919 INFLUENZA PANDEMIC

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ABSTRACT

The 1918–1919 influenza pandemic stands as one of the greatest natural disasters of all time. In a little over a year the disease affected hundreds of millions of people and killed between 50 and 100 million. When the disease finally reached Australia in 1919 it caused more than 12,000 deaths. While the death rate was lower than in many other countries, the pandemic was a major demographic and social tragedy, affecting the lives of millions of Australians. This paper briefly assesses the impact of the pandemic on Australia and NSW with particular reference to the demographic and social impact and the measures advanced to contain it.

The 1918–1919 influenza pandemic remains among the greatest natural disasters of recorded history, rivalling the Black Death of the 14th century in mortality and social and economic effects. Emerging in Europe in the final months of the Great War, in the short space of a little over a year the pandemic swept around the world, killing between 50 and 100 million people.[1] Few families or communities escaped its effects and possibly 25–30 per cent of the world's population was infected with influenza in 1918–1919. There was a series of pandemic waves, the first striking in the Northern Hemisphere spring of 1918. By October the disease had reached New Zealand. Despite a vigorous policy of maritime quarantine, the disease reached Australia in early 1919. The first wave in NSW occurred between mid March and late May, affecting twice as many males as females and resulting in about 31 per cent of total deaths. The second wave peaked in June and July and was more virulent than the first—it produced a higher mortality rate, involved more females and affected far more people over the age of 50 years (Figures 1 and 2).[2]

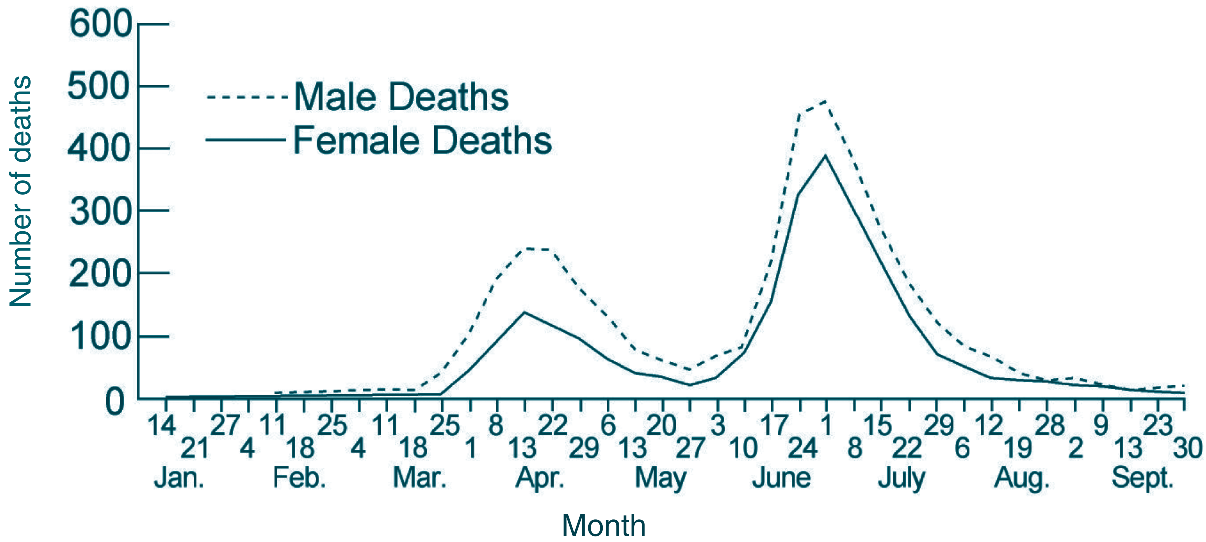
In Australia the pandemic was a major demographic and social tragedy, affecting the lives of millions of people. In a period of six months in 1919, probably more than 15,000 died from influenza and possibly as many as two million

Australians were infected. The 1920 *Official Year Book of the Commonwealth of Australia* put forward a figure of just under 12,000 deaths[3], but that is almost certainly an underestimate by at least 3000 to 4000. More than 5000 marriages were affected by the loss of a partner and over 5000 children lost one or both parents. In 1919, almost 40 per cent of Sydney's population had influenza, more than 4000 people died, and in some parts of Sydney influenza deaths comprised up to 50 per cent of all deaths.

Unlike other influenza pandemics, which mainly impacted on people at the extremes of life, the 1918–1919 outbreak infected young, healthy adults. In NSW, more than 52 per cent of all deaths occurred in people aged between 20 and 39 years, and there were twice as many deaths from

FIGURE 1

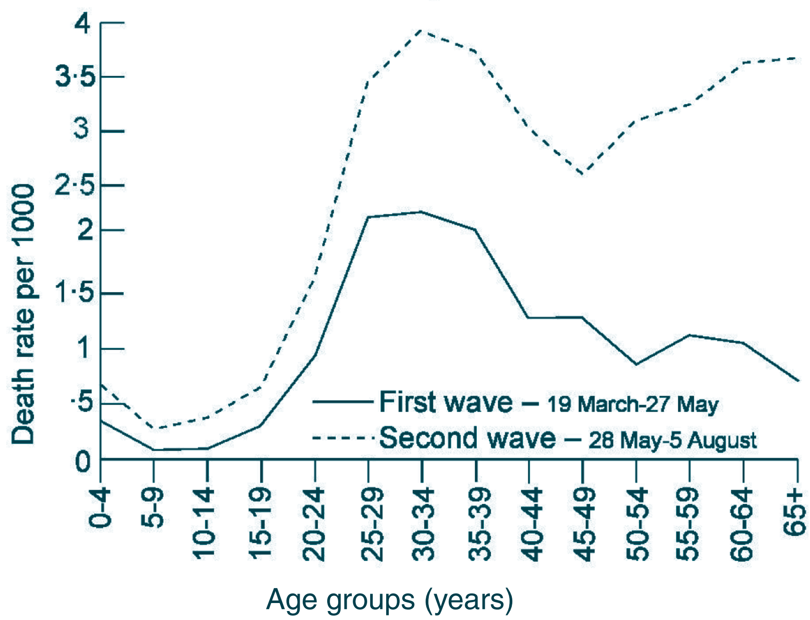
NUMBER OF DEATHS PER WEEK DURING THE 1919 INFLUENZA PANDEMIC, NEW SOUTH WALES



Source: NSW Department of Public Health—Influenza Report 1920

FIGURE 2

DEATH RATES FOR 5-YEAR AGE GROUPS FOR THE TWO WAVES OF THE 1919 INFLUENZA PANDEMIC, NEW SOUTH WALES



Source: NSW Department of Public Health—Influenza Report 1920 influenza in this age cohort than in the 0–4 years and the 50 years and over age groups combined. Adults aged between 25 and 34 years contributed almost one third of all deaths. Such an age distribution stands in sharp contrast to most other influenza pandemics, including the 1891 influenza pandemic, when the majority of deaths in NSW occurred in people aged over 60 (Figures 3 and 4).[4] It is uncertain why the epidemic infected so many people in the prime of life.

As indicated in Figures 3 and 4, the epidemic also took a substantially heavier toll of males than females. It is hypothesised that this sex-patterning is explained by differential socio-behavioural risk factors relating to geographic mobility and mixing; for example, the higher workforce participation rate of males and male-dominated practices such as drinking in hotel bars and attending crowded sporting events were likely sources of increased risk of infection.

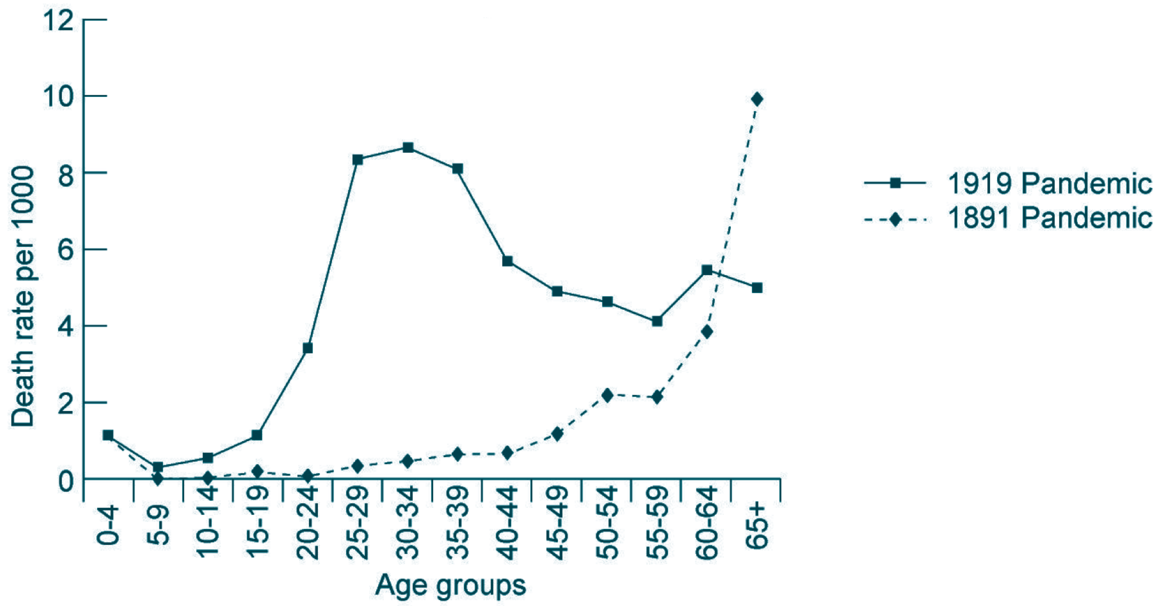
Globally, the mortality rate varied considerably. Australia experienced a mortality rate of close to three deaths per thousand, while in nearby New Zealand it was almost double this figure. In some isolated populations the pandemic took a much heavier toll. In Western Samoa there were 8,500 deaths in a total population of only 38,000—a death rate of 221.92 per thousand.[5]

Indigenous populations were also severely affected. In New Zealand, the Maori population was seven times more likely to die from influenza than European New Zealanders, and their death rate exceeded 42.3 per thousand.[6] Australia's indigenous population was also severely affected, with a mortality rate approaching 50 per cent in some communities.[7] The pandemic created terror among the inhabitants of Aboriginal stations and missions. At Barambah Station in Queensland at least 600 contracted the disease and in early 1919 a total of 800 became infected at Yarabah and Taroom Stations.

Australia, like most countries, was ill prepared to cope with such a disaster. The war had severely disrupted social and economic life, removed many medical personnel and disrupted public services. In an attempt to contain the outbreak, Australian authorities instigated a combination of strategies. Schools, theatres, dance halls, churches, pubs and other places of public congregation were shut, streets were sprayed, special isolation depots were established and people were compelled to wear masks in public. Movement by public transport was restricted and state borders were closed, with quarantine camps established at border crossings. Attempts were made to produce a vaccine using a mixture of victims' sputum, streptococcus and staphylococcus concoctions. Hundreds of thousands of people demanded inoculation and the government established more than 1260 public inoculation depots throughout Sydney, as well as relying on private practitioners. In a little over six months, more than 819,000 inoculations were performed, including more than 440,000 in Sydney, which was more than 50 per cent of the city's population.[9] People were urged to practice personal preventive measures such as cough etiquette, hand washing, ventilation and disinfection.

FIGURE 3

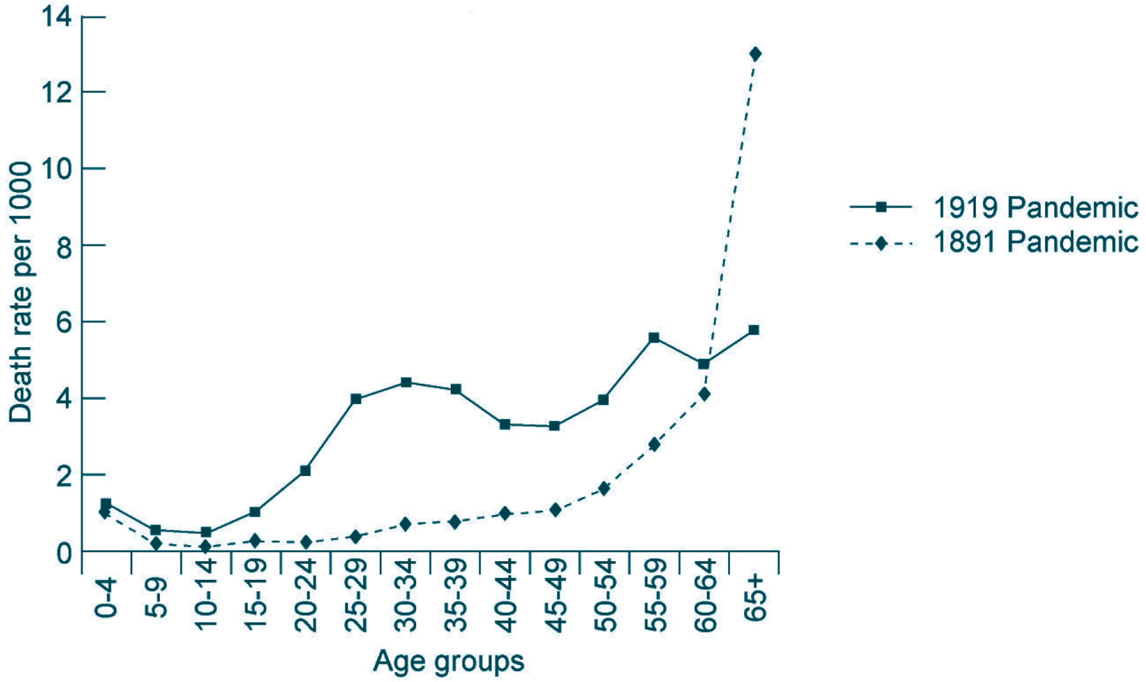
COMPARISON OF DEATH RATES FOR MALES, IN 5-YEAR AGE GROUPS, FOR THE 1891 AND 1919 INFLUENZA PANDEMICS, NEW SOUTH WALES



Source: NSW Department of Public Health—Influenza Report 1920

FIGURE 4

COMPARISON OF DEATH RATES FOR FEMALES, IN 5-YEAR AGE GROUPS, FOR THE 1891 AND 1919 INFLUENZA PANDEMICS, NEW SOUTH WALES



Source: NSW Department of Public Health—Influenza Report 1920

In a short time, hospitals were overwhelmed and health care workers pushed to breaking point. At the onset of the pandemic, NSW had only 2000 hospital beds. Between January and September more than 25,000 people in NSW were admitted to hospital with influenza, requiring the establishment of hundreds of temporary influenza hospitals in private homes, schools, showground buildings, churches, gaols, bowling clubs, tearooms, drill halls and courthouses. The pandemic also took its toll on medical and healthcare workers. In Sydney more than 800 were incapacitated with influenza and many temporary hospitals had to be staffed by lay volunteers.

The public was stunned by the ferocity of the pandemic and newspapers fanned public unease with regular reports of cases and deaths and lurid descriptions of former plagues. There were reports of people waking fine in the morning and being dead from influenza by nightfall. With so many people off work due to illness, normal services and activities were severely disrupted. Thousands sought popular cures and medicines. Many people rebelled by circumventing the quarantine blockade at state borders or refusing to wear masks. Waterside workers refused to unload ships for fear of infection and some public workers demanded 'epidemic pay'. People shunned outsiders and interstate visitors, fearing they were a potential source of infection.

The pandemic caused disputes between all the states and between the states and the Commonwealth over border closures, differing policies of border controls and quarantine, interstate transport links, and the quarantine of returning servicemen. Eventually, cooperation between the states and the Commonwealth authorities was abandoned, with each state imposing its own conditions and organising its own containment policies.

There are many lessons to be learnt from Australia's experience of influenza in 1919. The pandemic tells us something about how people and communities react to severe disease crises, particularly in a context where governments and conventional medical science offer no real measures of abatement or cure. Secondly, Australia's experience with the pandemic demonstrates how public health preparedness for such events requires a full appreciation of the impact on health care facilities and medical personnel, as well as of the logistical difficulties of delivering vaccines or other drugs in a timely fashion to a large population. Thirdly, it is clear that the media play a defining role in presenting a pandemic to the public and can, by word and image, temper or enflame human reaction. Many of the measures introduced by governments to contain pandemics, such as quarantine, border controls and restrictions on travel and public gatherings, may in their own right aggravate the human response by heightening fears and anxieties. Finally, the 1919 experience clearly demonstrates that cooperation between various governments and government authorities during such crises cannot always be taken for granted.

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THE RISK OF AVIAN INFLUENZA IN BIRDS IN AUSTRALIA

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ABSTRACT

Avian influenza viruses may cause mild or severe disease in birds. There have been five recorded outbreaks of highly pathogenic avian influenza in birds in Australia, all of which were caused by the H7 subtype. These were quickly controlled and similar coordinated responses are expected for possible future outbreaks of avian influenza. Migratory birds are not regarded as the source of these outbreaks, and the prevalence of avian influenza viruses in wild birds in Australia is very low. Avian influenza H5N1, which emerged in birds in China in 1996, has spread to bird flocks in Asia, Europe and Africa. The main carriers of avian influenza, ducks, do not migrate to Australia, and currently the risk of H5N1 occurring in Australian birds appears to be low. Nevertheless, surveillance and response plans for outbreaks of highly pathogenic avian influenza have recently been upgraded across Australia.

Avian influenza is a viral disease that primarily infects birds. This article describes avian influenza and provides information about outbreaks of avian influenza that have occurred in bird flocks in Australia. It also examines the risk of avian influenza H5N1 (hereafter also referred to as H5N1) occurring in birds in Australia.

Avian influenza viruses are classified into two groups based on their ability to cause disease in birds: the highly pathogenic strains that multiply in a wide variety of organs in the bird and can cause severe disease; and the low pathogenic strains that multiply in the intestines and respiratory tract only, and cause either no or mild disease, and low mortality.[1] Avian influenza viruses are also classified by the combination of two groups of proteins: hemagglutinin proteins (H) and neuraminidase proteins (N).

Influenza viruses have been reported in more than 90 species of birds. Ducks and other waterfowl (see Box 1 for definitions of the types of birds referred to in this article) are the recognised reservoir of avian influenza viruses and harbour all known subtypes of the influenza A virus. The low pathogenic viruses, including some H7 and H5 subtypes (which are the subtypes that most often turn into the highly pathogenic strains), rarely cause clinical signs in waterfowl, unlike the highly pathogenic H5N1, which can cause disease in these birds. Other wild waterbirds, like shorebirds, carry the low pathogenic avian influenza viruses, but at a much lower frequency than waterfowl.[1]

The introduction of low pathogenic viruses into susceptible poultry populations occasionally results in a mutational shift in the virus to produce highly pathogenic strains associated with severe disease.[2] Clinical signs of infected poultry include: reluctance to move, eat or drink; droopy appearance; severe respiratory distress; inability to walk or stand; unusual head and neck posture; and escalating flock mortality. Poultry can become infected with avian influenza through direct contact with an infected bird or infected material such as faeces, or through the consumption of food or water that is contaminated with the virus (which has the ability to survive several days in medium temperatures in areas not exposed to direct sunlight).[3]

Large scale outbreaks of highly pathogenic H5 and H7 avian influenza lasting for many years have occurred in poultry on many occasions in different regions of the world.[4] However,

BOX 1

GLOSSARY OF TERMS DESCRIBING THE TYPES OF BIRDS REFERRED TO IN THIS ARTICLE

Waterbird	Any bird whose natural habitat is water.
Waterfowl	A specific category of waterbird that includes ducks and geese.
Shorebirds	A waterbird that lives on the shores of beaches and lakes, such as seagulls, sandpipers and terns.
Poultry	Chickens, turkeys, domestic ducks and geese, partridge, guinea fowl, quails and pheasants.
Wild birds	Any type of non-captive bird.
Aviary birds	Any bird that lives in a cage or aviary– this usually refers to parrots, finches and canaries.
Migratory birds	Any bird that migrates. In Australia this is mostly shorebirds, as the majority of waterfowl are non-migratory.

the recent outbreaks of H5N1 in poultry flocks across the world are unprecedented in their spread, and have resulted in large numbers of poultry deaths. Theoretically, such outbreaks could provide opportunities for exchange of viral segments (reassortment) with human influenza virus, which could result in a new strain of human influenza. There is no evidence, however, that any of the avian viral components involved in the 1957 and 1968 human pandemics, or any human epidemic, originated from domestic poultry. In addition, the avian viruses involved in the 1957 and 1968 pandemics were not highly pathogenic viruses, unlike the currently circulating H5N1 virus. The 1918 influenza pandemic virus, although a descendent from an avian virus, was not acquired directly from its avian donor[5,6] and is genetically unlike any other avian or mammalian influenza virus examined over the past 88 years.[7]

OUTBREAKS OF AVIAN INFLUENZA IN AUSTRALIA

Despite the presence of poultry in Australia since 1788 and regular movements of very large numbers of migratory birds to Australia each year, the first avian influenza outbreak was recorded in Australia in 1976. Australia has had five outbreaks of avian influenza in birds, all caused by the highly pathogenic H7 subtype, and all in chickens in cages or barn type housing. Three outbreaks occurred in Victoria (1976, 1985, 1992), one in Queensland (1994) and one in NSW in 1997.[8,9] The outbreaks were controlled quickly by the slaughter of all the birds on the infected farms; disinfection; movement controls; and surveillance in the area to detect new foci of infection.[8]

In four of the five outbreaks, while there was a presumptive association with wild waterbirds, there is little evidence to support this.[8] The most likely 'ancestor' of the first Australian avian influenza outbreak in 1976 was H7 virus from a domestic duck.[10] Emus have been considered as a possible source in the 1997 outbreak in NSW.[9] Genetic analysis of the isolates from the 1976 to 1994 Australian outbreaks is also not consistent with introduction by migratory birds.[11] The H7 subtypes involved in the Australian outbreaks have never been detected in wild waterbirds in Australia, either before, during or after the poultry outbreaks.[12]

Infection with other low pathogenic avian influenza viruses among wild waterbirds in Australia has been found to be infrequent and extremely low[13] compared with a 19 per cent infection rate in Europe[14] and up to 34 per cent infection among ducks in North America. [15]

THE SPREAD OF AVIAN INFLUENZA H5N1

Avian influenza H5N1 was first reported in China in 1996 as a cause of disease in geese. The virus was a reassortment of avian influenza viruses from goose, quail and possibly teal.[16] Initially the H5N1 outbreaks were only reported in poultry in South East Asia. Subsequently, H5N1 outbreaks were also reported in wild birds in zoological parks in South East Asia[17], and in wild birds in China, Mongolia, Kazakhstan, and Western Siberia, with subsequent spread to Europe, Africa and the Middle East (Table 1). From 2003 to July 2006, the total number of poultry outbreaks due to H5N1 in South East Asia exceeded 3100. [18] The number of dead and culled birds is estimated to exceed 220 million and the economic impact in this region alone is estimated in excess of $10 billion.[19]

Avian influenza H5N1 spread from its source in Southern China to other countries through the transportation of poultry and poultry products, and through bird migration.[20] Between 1996 and 2003 several consignments of live ducks, live geese and duck meat from China were found to be infected with H5N1 on arrival in Hong Kong, Vietnam, South Korea and Japan.[18] Genetic analysis suggests that there was further spread from China to Vietnam through poultry trade in 2005. [20] Transmission within poultry is recognised as the major mechanism for sustaining the virus within the Asian region.[20]

Some of the birds that were found to be infected with H5N1 in West-Siberia in October 2005, seasonally migrate to Africa, Europe, India and South East Asia, but not to Australia.[21]

Wild waterfowl[22] and movements of poultry and poultry products appear to have played a role in the European spread.[23] In Africa, infection with H5N1 was reported initially in Nigeria[24], a country with extensive trade in poultry with China and Turkey, where H5N1 outbreaks had been reported earlier. None of the main wild bird species wintering over in the African countries has been found with infection in Europe, nor has H5N1 been found in wild birds in Nigeria, Niger or Cameroon. The current outbreaks of H5N1 in eight African countries appears to be related to trade in poultry for human consumption, including illegal trade. [25]

RISK OF AVIAN INFLUENZA H5N1 IN BIRDS IN AUSTRALIA

The four main potential routes of avian influenza H5N1 into a country are the movements of: infected poultry (and poultry products); aviary birds; contaminated materials; and migratory wild birds.

No significant poultry trade exists between Australia and other countries, and uncooked poultry products are not allowed into Australia. The risk from smuggled live birds or their products always exists. The risk of humans visiting infected regions and on return introducing infection through contaminated materials is also a possibility.

The recognised reservoir of the avian influenza virus—ducks and other waterfowl from infected regions of the globe—do not migrate to Australia, and Australian ducks are predominantly non migratory with only a few species occasionally reaching the Torres Straits and New Guinea. [26]

A significant group of birds that migrate across the infected South East Asian region is the shorebirds. Their migration starts in the Arctic Circle (Northern Siberia and Alaska) and most species take several weeks to reach Australia. In the regions infected with H5N1, this virus has not been found in the species of shorebirds that migrate to Australia. Approximately 3 million shorebirds reach Australia each year. [27] Since 1996 approximately 27 million shorebirds have visited the Australian continent and despite the presence of H5N1 in the South East Asian region, as well as other subtypes like H6N2 and H9N2[28,29], no disease has been reported in the wild bird population or domestic poultry in Australia.

The other significant migration occurs when muttonbirds (shearwaters) arrive in Australia. The flyway of these species is mostly over the sea and despite their huge numbers their flyway is not across areas currently infected with H5N1. Thus the risk posed by this group of birds is low.

A number of Australian bird species migrate to Torres Strait and New Guinea, where H5N1 has not been reported. Some migration range extends to Indonesia.[25] This is regarded by some as imposing a significant risk; however, other avian infectious diseases present in Indonesia have not spread to Australia. One example is Newcastle disease, which was reported in Indonesia as early as 1926[30]—despite the ability of the virus to infect as many avian species as the avian influenza virus, it has not spread to Australia.

The risk from migratory birds, such as shorebirds or muttonbirds, depends on a variety of circumstances including: the H5N1 status in the Arctic Circle during breeding or pre migration staging; the migration time; the infective status of the birds on arrival in Australia; and the H5N1 status of other countries en-route. No cases of avian influenza H5N1 have been found in countries traversed by migrant birds en route to Australia (the Philippines, Taiwan, New Guinea, East Timor and New Zealand). Blood samples of migratory birds from Northern and Western Australia,

TABLE 1

COUNTRIES AND AUTONOMOUS REGIONS WITH H5N1 INFECTION IN POULTRY OR WILD BIRDS (JULY 2006)

Asia	Year*	Europe	Year	Near/Middle East and Africa	Year
China	1996	Russia	2005	Iran	2006**
Hong Kong	1997	Romania	2005	Iraq	2006
S Korea	2003	Turkey	2005	Cyprus	2006
Indonesia	2003	Azerbaijan	2005	Nigeria	2006
Japan	2004	Ukraine	2005	Egypt	2006
Vietnam	2004	Bulgaria**	2006	Niger	2006
Thailand	2004	Hungary**	2006	Cameroon	2006
Malaysia	2004	France	2006	Jordan	2006
Tibet	2004	Slovakia**	2006	Gaza	2006
Cambodia	2004	Slovenia**	2006	Israel	2006
Lao PDR	2004	Bosnia**	2006	Burkina Faso	2006
Mongolia**	2005	Albania**	2006	Ivory Coast	2006
Kazakhstan	2005	Italy**	2006	Sudan	2006
India	2006	Poland **	2006	Djibouti	2006
Myanmar	2006	Germany	2006		
N Korea	2006	Austria**	2006		
Afghanistan	2006	Greece**	2006		
Pakistan	2006	Croatia**	2006		
		Scotland**	2006		
		Denmark**	2006		
		Sweden **	2006		
		Spain **	2006		

* Only initial outbreak in any species is listed **Outbreaks only in wild birds

Sources: [18] and FAOAIDS news. Update on the Avian Influenza situation Issue No 39 at www.fao.org/ag/againfo/subjects/documents/ai/AVI-bull039.pdf

H5N1 outbreaks summaries www.birdlife.org/action/science/species/avian_flu/pdfs/hn51_outbreak_weeks.pdf - The table covers the period until July 2006 where migratory birds are first likely to encounter the Australian mainland, have shown no evidence of exposure to H5N1.[31]

Once infected, provided they remain healthy, migratory birds could carry H5N1 to Australia. Examining 13,115 wild birds in Asia between 2003 and 2005, Chen et al[20] found only a very small proportion (0.046 per cent) carried the H5N1 virus. Following infection, waterfowl excrete the virus for three to seven- days.[20] If the excretion period in shorebirds is similar, the opportunity for avian influenza H5N1 to be carried to Australia via migratory birds that travel 12,000 km (a journey that may take several weeks) could be limited.

The lack of an association between previous Australian outbreaks and migratory birds, and the lack of spread of other avian diseases from Asia to Australia, could indicate a low risk for the introduction of H5N1 by migratory birds into Australia. Indeed, the risk from migratory birds has been recognised as low.[32] Even so, continuous evaluation and monitoring of birds is planned, especially around the peak migration period.

SURVEILLANCE AND RESPONSE PLANS

A national surveillance program for influenza viruses in wild birds, targeting between 60 to 300 young ducks and shore birds in at least two locations in each state, is currently being planned to coincide with the peak migration period (October to November). Swabs will be taken from live or freshly dead birds. A national zoo-based program is also being planned to examine wild birds in zoos.

Investigations of mortality among wild birds and/or domestic and commercial poultry are routinely undertaken when reported by the public or bird keepers. A recent survey of commercial poultry across Australia has confirmed freedom from highly pathogenic avian influenza viruses.

In response to the outbreaks of avian influenza H5N1 in poultry flocks around the world, strategies to reduce the risk of introduction of disease agents into poultry farms (biosecurity) have been upgraded. Plans have been developed to minimise the impact of an outbreak through early detection and effective response. National exercises have been held around Australia to refine the capacity of government and the poultry industry to respond to an outbreak (for example, Exercise Eleusis, held in 2005). In addition, NSW has initiated training of personnel to enhance the capacity for early detection.

In the event of an outbreak of avian influenza in poultry in Australia or the appearance of a highly pathogenic avian influenza virus among wild waterfowl, the national disease strategy for Avian Influenza (AUSVETPLAN), will be implemented. Action will include the destruction of all poultry on infected premises; possible pre-emptive culling on other premises; cleaning and disinfection of infected premises; tracing and surveillance; upgrading of biosecurity on poultry farms; increased public awareness; and vaccination of poultry, especially in high density poultry areas or if there is evidence of rapid spread.

The slaughter of wild birds is not part of the plan.[3] However, in the event that wild birds are found with H5N1 in Australia, public and industry awareness will be raised and surveillance on farms within the immediate detection zone will be implemented. The AUSVETPLAN website is: www.animalhealthaustralia.com.au/programs/eadp/ausvetplan.

CONCLUSION

Avian influenza H5N1 has not been detected in Australia. Although five outbreaks of avian influenza in poultry have occurred in Australia, all involving H7 subtypes, it is unlikely that they originated from migratory birds. There is no evidence to suggest that either low pathogenic or highly pathogenic influenza A viruses of poultry origin have been involved in any human influenza pandemic or epidemic. The risk of introduction of H5N1 to Australia appears to be low, although scientific uncertainties about the virus and its epidemiology make any prediction unwise. To accommodate this threat and uncertainty, preparedness and biosecurity on poultry farms have been upgraded.

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COMMONWEALTH PANDEMIC PREPAREDNESS PLANS

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ABSTRACT

This paper describes the work being done by the Australian Government Department of Health and Ageing to prepare for a possible influenza pandemic. It provides an overview of Australian Government initiatives and explains both the purpose and the content of the Australian Health Management Plan for Pandemic Influenza. It summarises efforts to improve regional detection and response capabilities and it explains the role of simulation exercises in Australian pandemic planning.

The continuing global outbreak of H5N1 avian influenza (hereafter also referred to as H5N1) has raised the spectre of a new influenza pandemic. In H5N1, we have a novel influenza strain that is highly pathogenic to many bird species and which has crossed the species barrier to cause severe disease in humans and other mammals. Thankfully, H5N1 does not easily infect humans. At the time of writing there have only been a few more than 240 cases worldwide, despite large numbers of people living in close proximity to infected birds. Nor does it pass efficiently between humans, as our seasonal human influenza strains do. While it is not inevitable that H5N1 will take the next step to become an effective human pathogen and so trigger a pandemic, its existence provides a timely reminder that all nations individually and collectively need to be fully prepared for the next influenza pandemic, whatever its origin.

Australia is well prepared to respond to an outbreak of avian influenza or an influenza pandemic, thanks to the years of hard work by government departments, agencies, institutions and individuals across the country. This article briefly describes the range of initiatives undertaken by the Australian Government Department of Health and Ageing to prepare Australia and the region for a possible influenza pandemic. It provides an overview of the Australian Health Management Plan for Pandemic Influenza.[1] It also provides an update on arrangements for a national pandemic management simulation exercise to be held in October 2006.

OVERVIEW OF COMMONWEALTH INITIATIVES

The Australian Government has devoted significant resources to building national preparedness and a capacity for an immediate and effective response to any pandemic alert. These measures include:

- creating an Office of Health Protection to develop and coordinate Australia's response to health threats and emergencies such as pandemic influenza
- establishing the National Medical Stockpile, which has one of the largest per capita supplies of influenza antivirals in the world as well as personal protective equipment and other essential health supplies to deploy during an influenza pandemic
- strengthening Australia's communicable disease surveillance networks and laboratory capacity
- contracting two influenza vaccine manufacturers for a guaranteed pandemic vaccine supply to protect the Australian population
- funding CSL Limited (a pharmaceutical company) to fast track production of an H5N1 candidate vaccine to allow for more rapid production of a pandemic vaccine should the pandemic strain be closely related to H5N1
- providing substantial research grants to help solve some of the basic questions around pandemic influenza
- providing technical and financial assistance to several of our regional neighbours to strengthen their human and animal communicable disease control systems and pandemic preparedness planning
- developing a comprehensive communications strategy for use in the event of a pandemic
- conducting a pandemic simulation exercise in late 2006
- funding an upgrade of the World Health Organization Collaborating Centre for Reference and Research on Influenza in Melbourne.

More information on these and other initiatives and on the role of the Office of Health Protection can be found at www.health.gov.au.

THE AUSTRALIAN HEALTH MANAGEMENT PLAN FOR PANDEMIC INFLUENZA

The 2006 Australian Health Management Plan for Pandemic Influenza (the 'Plan'), building on earlier pandemic plans, provides an overarching guide for the Australian health response to a pandemic influenza threat. The updated Plan is an accessible, plain English document designed to meet the information needs of the widest range of Australians.

The Plan is complemented by a series of technical papers. Some of these papers—for example, Interim Clinical Guidelines[2] and Interim Infection Control Guidelines[3]—are available now. Others will be released progressively in the coming months. The Plan and copies of currently available technical papers are available from www.health.gov.au.

Underpinning the Plan is an enhanced understanding of the likely public health responses to an outbreak of pandemic influenza. In December 2005, a report was commissioned by the Australian Government Department of Health and Ageing to use mathematical models to assess public health responses to an outbreak of infectious viral respiratory disease.[4]

The resultant modelling points to the benefit of early detection and rapid response and to a synergistic effect of public health interventions supporting the use of multiple strategies. It indicates that a containment strategy is likely to be effective and may contain a pandemic for several months. It further indicates that community public health interventions such as social distancing and home quarantine, together with the use of targeted antiviral prophylaxis for people exposed to the virus, can dramatically reduce transmission. It indicates that containment of a pandemic may be achieved if intensive multiple public health efforts are applied.

The Plan is complemented by the National Action Plan for a Human Influenza Pandemic (NAP), which brings together Commonwealth and state and territory government planning. The NAP was prepared by the Council of Australian Governments and is available from www.pmc.gov.au.

REGIONAL AND INTERNATIONAL INITIATIVES

The Australian Government has committed $152 million to initiatives to improve the detection and surveillance, emergency preparedness and response capabilities of countries in the region.

In November 2005, the Prime Minister announced funding of $100 million over four years for initiatives that will combat the threat of pandemics and other emerging infectious diseases within the Asia-Pacific region. Some $90 million will be used to help regional economies prepare and to support organisations working across the region, while the remaining $10 million will be used for specific Asia-Pacific Economic Cooperation (APEC) activities on avian influenza.

Australia is working closely with peak multilateral agencies such as World Health Organization, the Food and Agriculture Organization, and the World Animal Health Organization. It also works closely with regional organisations such as the Association of Southeast Asian Nations and the APEC forum, and with other major donor countries and agencies to coordinate assistance for avian and pandemic influenza in the region. Australia participated in the International Pledging Conference on Avian and Human Influenza in Beijing in January this year and we have been working closely with our regional partners to ensure that assistance is effectively provided to countries in need, without duplication of effort.

Work has also been done at the international level to ensure an effective global response to avian and pandemic influenza. Australia is a foundation member of the International Partnership on Avian and Pandemic Influenza, which brings together concerned states to develop our global capabilities to respond to the pandemic threat in a coordinated manner. This International Partnership first met in October 2005 and met again in June 2006.

Australia is also coordinating a range of regional pandemic projects, including an APEC pandemic communications exercise that aims to maximise regional coordination of pandemic influenza responses. An APEC project on ‘Functioning Economies During Times of Pandemic’ will assist in ensuring economic life can continue in the event of a pandemic.

SIMULATION EXERCISES

The Australian Government recognises the importance of testing our preparedness for health disasters such as influenza pandemics. One of the most effective ways to test preparedness and response plans is by conducting exercises.

In late 2005, all states and territories participated in *Exercise Eleusis 05*, an avian influenza outbreak desktop exercise conducted under the auspices of the Australian Government Department of Agriculture, Fisheries and Forestry. The aim of the exercise was to evaluate Australia’s capability to manage emergency zoonotic disease outbreaks across industry and government, including testing: (a) the integration of nation-wide emergency zoonosis arrangements, (b) communication capabilities and (c) disease control policies and strategies.

Specific objectives for Australian Government Department of Health and Ageing in relation to Exercise Eleusis included evaluating performance and compliance in relation to the 2005 Management Plan, communications between participating agencies and with key advisory committees, and governance arrangements of actions such as antiviral deployment, medical equipment deployment and potential activation of quarantine. Surveillance arrangements, media communications, and information sharing between agencies were also evaluated.

Lessons learned from Eleusis are helping the Australian Department of Health and Ageing to conduct a national influenza pandemic exercise to assess the Australian human health system’s capacity to effectively respond to an influenza pandemic. This exercise, *Exercise Cumpston 06*, will focus on the Australian health response as set out in the 2006 Australian Health Management Plan for Pandemic Influenza and related technical papers. It will test Australia’s level of preparedness and identify any gaps or shortfalls. The exercise is named after John Howard Lidgett Cumpston, the first Director-General of the Commonwealth Department of Health, who was appointed when it was created in 1921. Cumpston was in charge of the Quarantine Service in 1918 and is credited with introducing Australia’s successful influenza quarantine measures.

The live simulation phase of the exercise will occur in October 2006 and will test everything from border measures to localised outbreak containment and public health responses. It will exercise key decision-making steps and processes to move to the maintenance phase during a pandemic. While the live exercise will be conducted in one state, all the other states and territories will be involved, enabling the Government to test governance arrangements and strategic level decision-making within and between jurisdictions at all levels.

Other elements of the Plan have been covered through discussion exercises and workshops in the months leading up to the operational phase. These activities have addressed border control and screening, decision-making, deployment of the national medical stockpile and the national health emergency response. They have involved all states and territories, as well as Australian Government agencies.

Effective communication between participants and between participants and the public/front-line health providers is a particular focus of all elements of *Cumpston 06*. A final consolidated report will be prepared in early 2007 to disseminate the findings to policy makers and to enable future exercises to draw on the *Cumpston 06* experience.

CONCLUSION

The Australian Government has set in train a wide range of initiatives to prepare the nation in the event of an influenza pandemic. Planning and plan testing, involving all levels of Government, are important parts of the work being done to limit the impact of any pandemic on the well being of Australians.

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PREPARING FOR THE NEXT INFLUENZA PANDEMIC: A NEW SOUTH WALES PERSPECTIVE

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ABSTRACT

Pandemic influenza is one of a small number of infectious diseases that pose a significant global threat. Pandemic preparedness has accelerated around the world in recent years in response to the perceived increased risk of a pandemic developing following the emergence of H5N1 avian influenza in domestic poultry flocks in Asia, Africa and Europe. There is a hierarchy of pandemic plans – international, national, state, and local – and harmonisation of all of these is imperative for a coordinated and effective response. At the national and state levels, plans have been developed for a whole-of-government response to a pandemic, in addition to plans specifically for the health sector. It is inevitable that influenza pandemics will occur and careful planning is crucial to mitigate their potentially devastating effects.

Pandemic influenza is one of a small number of infectious diseases that pose a significant global threat. This group of infectious diseases are characterised by a capacity to cause significant degrees of illness, death, economic loss, and public fear and panic. A convenient way of classifying them is as *emerging, re-emerging*, and *deliberately emerging* infectious diseases.[1] Emerging infectious diseases are those that have never been recognised before, a recent example being severe acute respiratory syndrome (SARS). Influenza pandemics are an example of re-emerging infectious diseases, which are those that have been recognised for some time but undergo a resurgence in a different form or geographical location. Deliberately emerging diseases are those that are intentionally introduced and are synonymous with diseases caused by agents of bioterrorism.

These different types of infectious diseases are dealt with here as a group because there are many overlapping preparedness activities for each of them.[1] Of these disease threats, influenza pandemics present the greatest potential risk in that, by their very nature, the entire population will be at risk at the same time and the virus spreads quickly. Should the pandemic influenza virus be highly virulent, as H1N1 was in 1918–1919, then large-scale deaths could result. SARS, by comparison, caused less than 0.1 per cent of the deaths that resulted from the mildest influenza pandemic of the last century.[2,3] The magnitude of the threat to the public health posed by an influenza pandemic means that preparing adequately for such an event will go a long way towards preparing for all large-scale infectious disease threats.

WHY DO WE NEED TO PREPARE?

The world needs to prepare for the next influenza pandemic for two important reasons. First, a pandemic *will* occur at some stage in the future. History has shown us that influenza pandemics do occur periodically – approximately every 10 to 50 years, based on pandemics that have occurred over the past 300 years – and there is no reason to believe that they will not continue to occur. The influenza viruses that caused the past three pandemics – the Spanish influenza pandemic of 1918–1919, the Asian influenza pandemic of 1957–1958, and the Hong Kong influenza pandemic of 1968–1969 – all originated, either wholly or in part, from avian influenza strains.[1,4] The risk of a pandemic influenza virus developing from the HN51 avian influenza strain causing the current epizootic in domestic and wild birds on three continents is unknown, but the sheer magnitude of the global viral load of H5N1 has many experts predicting that the current risk is at the highest level for several decades.

Second, although the severity of the next pandemic cannot be accurately predicted, the effects are potentially significant in terms of morbidity, mortality and disruption to the social fabric. By preparing for such events, these effects may be lessened.

HIERARCHY OF INFLUENZA PANDEMIC PLANS FOR THE HEALTH SECTOR

To ensure a coordinated and effective response to an influenza pandemic it is imperative that pandemic plans at all levels of governance—international, national, state, and local—work in harmony.

International plans

At the international level, leadership in global pandemic planning has been provided by the World Health Organization (WHO), which accelerated its preparedness activities in the wake of the 1997 H5N1 avian influenza outbreak in birds and humans in Hong Kong. The WHO produced its first global pandemic plan in 1999 and this was revised in 2005.[5] In these plans, the WHO urged all countries to formulate their own pandemic plans.

The framework on which the WHO plans are based is the so-called “WHO pandemic global alert phases”. To reflect the ongoing need for pandemic preparedness, the world is always in a defined phase. In recognition of the public health risk posed by avian influenza strains such as the H5N1 strain, these phases were redefined in the 2005 plan to give a greater emphasis to the public health response to avian influenza. Another important change in the 2005 plan was an acknowledgement that there may be a difference between the global alert level and the alert level in a particular country. At the time of writing in September 2006, the WHO pandemic alert level was at Overseas phase 3 (human infection with a new influenza subtype but only rare person-to-person transmission), and at Australia phase 0 (no animal influenza strains affecting humans). The final major change in the 2005 plan was factoring in the potential to contain or delay the spread of a new human influenza strain by a rapid, coordinated global and national response.

National plans

At the national level, the Australian Government has devoted significant resources to preparing for an influenza pandemic. Since 2003, more than $550 million has been budgeted for vaccine development, stockpiling antiviral medications and essential medical equipment, enhancing regional preparedness, and funding accelerated research in pandemic influenza fields.[6] In June 2005, the Australian Government Department of Health and Ageing released the *Australian Management Plan for Pandemic Influenza (AMPPI)*.[7] It adopted the concept of the WHO global pandemic phases and therefore is designed to be used at all times. The *AMPPI* outlines governance and decision-making arrangements, describes the ‘building blocks’ for pandemic planning, and sets out responses and roles and responsibilities for the various pandemic phases under five broad headings – planning and coordination, monitoring and surveillance, public health measures (non-pharmacological and pharmacological), health care and emergency response, and communications. A number of annexes provide a more detailed explanation of certain planning elements, and early guidelines for surveillance, laboratory, and infection control. In May 2006, a revised version of *AMPPI* was released, now entitled *Australian Health Management Plan for Pandemic Influenza* to differentiate it from non-health sector national pandemic plans, with three important annexes attached: *Interim Infection Control Guidelines for Pandemic Influenza in Healthcare and Community Settings*, *Interim National Pandemic Influenza Clinical Guidelines*, and *Communications Strategy Overview*.[6]

NSW plan

In November 2005, the *NSW Health Interim Influenza Pandemic Action Plan*[8] was released. It was called an ‘interim’ plan in recognition of the rapid progression in pandemic planning and the likelihood that early planning strategies would change, and to indicate that it would be updated regularly. Like the national plan, the NSW plan is based around the WHO pandemic phases and outlines governance and decision-making arrangements, describes the key elements of pandemic planning, and sets out responses and roles and responsibilities for the various pandemic phases under the same five broad headings of the *AMPPI*:

- **planning and coordination** involves the development and maintenance of state and local pandemic plans
- **monitoring and surveillance** calls for a number of complementary surveillance methods, including ‘conventional’ methods used for surveillance of seasonal human influenza as well as novel methods of influenza surveillance to be introduced in the later pandemic phases
- **non-pharmacological public health measures** include quarantining of individuals, towns or regions exposed to the pandemic virus, screening for influenza-like illnesses at borders, the use personal protective

equipment, and closure of schools and non-essential workplaces to lessen the rate of spread of the virus

- **pharmacological public health measures** are mainly concerned with anti-influenza drugs and vaccines (seasonal influenza and pneumococcal vaccines in the interpandemic period, and pandemic influenza vaccines when a novel influenza strain emerges)
- **health care and emergency response** includes the testing of pandemic plans, development and implementation of infection control and clinical management guidelines, hospital capacity, designated influenza hospitals, fever clinics, areas for mass quarantine of individuals, monitoring of contacts of cases, and workforce issues
- **communications** involves the timely provision of accurate information to the public, the healthcare workforce, and other key stakeholders.

Local plans

Finally, at the local level, each area health service in NSW has completed a draft influenza pandemic plan, based on a similar framework to state and national plans. Pandemic planning at the local level will be assisted by the appointment of eighteen biopreparedness officers and epidemiologists in 2006, enabled by the provision of additional funds by the NSW Government.

WHOLE-OF-GOVERNMENT PANDEMIC INFLUENZA PLANS

During the period that national and many jurisdictional health sector pandemic plans were being formulated and released in 2005–2006, there was a growing realisation that pandemic planning and response was not only a responsibility of the health sector but, rather, required a whole-of-government input. In response, at the national level, the Coalition of Australian Governments Working Group on Influenza Pandemic Prevention and Preparedness was formed and charged with preparing the *Australian Action Plan for Human Influenza Pandemic*. This was released in July 2006.[9] In November 2005, the NSW Premier established the NSW Influenza Pandemic Taskforce, comprising 22 state government agencies, to oversee state whole-of-government planning. The Taskforce released the *NSW Human Influenza Pandemic Plan* in August 2006[10]. This plan describes the governance arrangements that will be put in place during a pandemic, including the arrangements between the health sector and other NSW government agencies, and those between the NSW and Australian governments. It is a high-level strategic plan with operational detail to be included in supporting plans developed over subsequent months by various working groups. The focus of these working groups will be on the key areas of community management, workforce, body storage and disposal, border and quarantine, public information, information technology, continuity of the food-chain, and animal welfare.

WHERE TO FROM HERE?

During the past decade or so, the world has been confronted with a number of large-scale infectious diseases threats—the spectre of bioterrorism in the late 1990s, the emergence of SARS in 2003, and the fear of a possible influenza pandemic fuelled by the appearance and rapid spread to three continents of H5N1 avian influenza in wild and domestic birds. In response, significant resources have been devoted to preparing for infectious disease emergencies, and some governments have established dedicated units to oversee this preparedness activity, for example the Australian Government's Office for Health Protection, and the Biopreparedness Unit within NSW Health's Division of Population Health.

Biopreparedness efforts around Australia are currently concentrated on preparing for pandemic influenza, and this is likely to continue for the foreseeable future as a great deal of work remains to be done at all levels of government, in the health and non-health sectors, and in private enterprise. However, the emphasis may switch to planning for other threats depending on whether the balance of risk is perceived to shift to other biological threats.

There is, of course, an opportunity cost in tying up valuable human and material resources in preparing for an influenza pandemic. The balance that governments and business must strike in this regard is made difficult by virtue of the uncertain timing and severity of the next pandemic. Planning for a possible H5N1 influenza pandemic will not be in vain should H5N1 not result in a pandemic. It is inevitable that an influenza pandemic will occur at some stage in the future and the current Australia-wide planning activity will hold this country in good stead to counter the threat posed by such an event. Also, because of the many crossovers in the planning for pandemic influenza and other large-scale infectious disease emergencies, pandemic planning will be of great benefit to Australia in meeting the challenge posed by future emerging, re-emerging, or deliberately emerging infectious diseases.

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PANDEMIC PLANNING AT THE COAL FACE: RESPONSIBILITIES OF THE PUBLIC HEALTH UNIT

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ABSTRACT

Responding to an infectious disease pandemic requires a coordinated approach from all essential services. Public health units across NSW will play an important role in a range of control activities. These include: surveillance, education, communication, case ascertainment, case management (excluding clinical management), infection control, contact tracing, monitoring contacts in home quarantine, surveillance at borders, epidemiological studies and immunisation. Public health units are currently planning for such an emergency and these plans will need to be tested and refined under simulated conditions.

A well functioning disease surveillance system is necessary to ensure that the first cases of pandemic influenza are rapidly identified. Following this, control strategies will be implemented to retard the transmission of the virus while a vaccine is being developed. Surveillance will also detect the last case, signifying an end to the crisis. In between these two watershed surveillance events, public health units will play a pivotal role in responding to a pandemic. The purpose of this paper is to describe this role.

INTERNATIONAL, AUSTRALIAN AND NSW PLANS FOR A PANDEMIC

The World Health Organization has vigorously advocated global readiness for an influenza pandemic and planning by individual nations.[1] The Australian Government has adopted an inclusive process of policy-making with states and territories. Some of the strategies and plans developed by the Australian Government Department of Health and Ageing are described in the contribution by the Chief Medical Officer in this issue of the *Bulletin*.

For emergencies occurring in NSW, coordination of the response is governed by the *State Emergency and Rescue Management Act*, with the NSW Department of Health legislated to serve as the lead agency in responding to infectious disease emergencies. As all of society will be affected by a pandemic, the NSW Premier's Department is overseeing the involvement of other government departments and agencies in NSW.

Area health services across NSW will play a front-line role in providing clinical care in the event of a pandemic and ensuring appropriate local public health and mental health responses. Once the first few cases of pandemic influenza are identified, emergency departments will be placed on heightened alert to identify suspected pandemic cases. Dedicated influenza clinics will be opened when human-to-human spread has occurred within Australia. These clinics will manage all patients with symptoms suggestive of influenza to reduce the risk of infection to patients attending hospital for other reasons. Fever hospitals and staging facilities are planned for the clinical management of cases when existing acute care facilities are likely to be overwhelmed.

Since 2003, the World Health Organization has been monitoring the status of the avian influenza H5N1 strain that has caused deaths in people who have been in close contact with infected poultry.[2] It is fair to say that this concern has accelerated global pandemic preparedness.

THE ROLE OF THE PUBLIC HEALTH UNIT

Public health units will have a number of vital roles during a pandemic, including: surveillance, education, communication, case ascertainment, case management (but not clinical management), infection control, contact tracing, monitoring contacts in home quarantine, surveillance at borders, epidemiological studies and immunisation. While these duties are not foreign to public health units, the potential number of cases and urgency of response, and the need to maintain large databases, makes pandemic influenza a particular challenge. The full scope of implementation of certain of these activities is yet to be determined and the responsibility for delivery may be shared with other

TABLE 1

STAGES AND PHASES OF A PANDEMIC, AND THE AIM OF THE AUSTRALIAN GOVERNMENT RESPONSE

Pandemic stages	Phases of the pandemic	Aim of Australian Government response
Pandemic influenza containment stage	Localised human to human spread: Australian phases 3, 4, 5 & 6a	To aggressively contain and eliminate the disease. If this is unachievable, the secondary aim is to retard transmission and provide additional time for vaccine development
Pandemic influenza post-containment stage	Widespread transmission in the general population: Australian phase 6b	To maintain health services and other core services within the limitations of remaining resources

agencies. Public health unit planning must continue to interrelate with broader area health service planning.[3]

The Australian Government Department of Health and Ageing has implemented a phased approach to responding to a pandemic threat that corresponds to the epidemiological situation of novel influenza strains. The activity of public health units is governed by these designated phases[4], while the specific response obligations are described in the NSW Health Interim Influenza Pandemic Action Plan[5] and the Pandemic Influenza Response Protocol contained in the *NSW Notifiable Diseases Manual*. At the time of writing we are in Australian phase 0 and Overseas phase 3.

The Australian government response to a pandemic is divided into two broad stages according to local epidemic progression: containment and post-containment. The aim of these two stages, and how they relate to the pandemic phases, is provided in Table 1. The activities and plans of public health units vary during these two different stages as described in the rest of this article.

DIAGNOSIS, SURVEILLANCE AND NOTIFICATION OF CASES OF PANDEMIC INFLUENZA

Containment stage

During the containment stage of a pandemic, public health units will notify the NSW Communicable Diseases Branch of any human cases meeting the current case definition for suspected avian or pandemic influenza. When influenza clinics have been activated, public health units will work with clinical services to ensure accurate collection of data related to suspected cases, contacts and deaths for epidemiological and statistical purposes.

To achieve prompt recognition of the introduction into NSW of a pandemic influenza strain, public health units are reliant on notification by clinicians of cases of disease that are compatible both clinically and epidemiologically with the prevailing case definition. As this definition changes, the updated definition will be available at www.health.nsw.gov.au/pandemic/.

All patients that meet the case definition should have respiratory viral culture swabs collected for laboratory testing. Specimen quality is important for successful diagnosis. Testing for influenza by reverse transcriptase polymerase chain reaction (PCR) permits confirmation of the influenza subtype within 24 hours of receipt of a suitable specimen. This test is currently offered at a limited number of reference laboratories and is only available on an urgent basis after consultation with a clinical microbiologist.

All pathology requests for the H5N1 or pandemic strain should be notified to the local public health unit by the receiving laboratory or requesting doctor (prior to referral of the specimen to the reference laboratory) so that prompt investigation, including contact tracing, can be initiated. An effective surveillance system is reliant on fostering and maintaining a strong collaborative network with GPs, emergency departments, laboratories and respiratory physicians. Influenza viruses can also be cultured and sub-typed, although the timeframe required precludes this as a practical surveillance or initial diagnostic tool. Samples that are negative for the pandemic strain should be tested for seasonal influenza and other respiratory pathogens. The laboratory can recommend other samples or testing strategies to the referring doctor or public health unit. Once the pandemic strain has become established in Australia or a region of this country, the need for urgent laboratory diagnosis may not be necessary or practical on a large-scale basis. The case definition used for surveillance, notification and treatment will reflect the changing model of control.

Post-containment stage

During the post-containment stage public health units may only be required to provide tallies of new cases and deaths.

CASE MANAGEMENT, CONTACT TRACING AND HOME QUARANTINE

Containment stage

During the containment stage the public health unit's role will be to work with clinicians to facilitate the urgent investigation of suspected cases that accord with the case definition. They will ensure:

- appropriate specimen collection
- rapid laboratory testing
- appropriate management of cases to reduce infectiousness
- contact tracing
- provision of information to cases and contacts
- provision of prophylaxis to contacts
- infection control advice to cases, contacts and health care workers

- coordination of the management of cases and contacts in home isolation or quarantine for the residual of the incubation period determined by the Australian Government.

Post-containment stage

During the post-containment stage the contact tracing measures listed above will not generally be required because of the ubiquitous nature of infection and overwhelming workload; however, they may be effective in protecting isolated communities.

The public health units across NSW will be testing case management and contact tracing protocols through field exercises such as the Cumpston national exercise carried out in October 2006 and the Paton exercise in NSW to be carried out in November 2006.

IMMUNISATION

The development and delivery of an effective vaccine will be vital for limiting the impact of a pandemic although it is not anticipated that one will be available until late in the containment stage or, more likely, the post-containment stage. The logistics of immunising large numbers of people from varying socioeconomic and cultural backgrounds across a broad geographical area, whilst managing issues such as security and prioritisation of supply, must be determined beforehand and tested under simulated conditions.[6] Currently the mass vaccination plan has not been developed; however, the public health units' role will be to manage the logistics of vaccine supply and mass vaccination clinics in a timely, efficient and orderly fashion. Increasing the number of staff who are able to immunise, and developing and testing mass vaccination plans, are imperative to the success of the community vaccination program.

In addition, public health units will continue to encourage uptake of the pneumococcal vaccine to reduce the risk of concomitant bacterial infection. Vaccination against seasonal influenza is always recommended for people in 'at risk' groups but is particularly important during a pandemic alert period as it reduces the possibility of misdiagnosis with the pandemic strain and the potential for hybridisation.

SURVEILLANCE AT BORDERS

The Commonwealth Quarantine Act (1908) requires international ships and aircraft to report all suspected cases of influenza-like illness amongst passengers or crew to the Australian Quarantine Inspection Service before landing or berthing as part of routine pratique. This information is communicated through the Director of the Communicable Diseases Branch—in the Director's capacity as NSW Chief Human Quarantine Officer—to the local public health unit for management of cases and contacts. This system should be equally functional during a pandemic, although the captain of an international ship or aircraft will be expected to actively report the health status of their passengers.

Once human-to-human spread of a novel influenza strain has been confirmed and Overseas Phase 4 has been declared, area health services that contain an international air or sea port may be requested to participate in active surveillance of incoming (and possibly outgoing) passengers for influenza signs and symptoms. Thus collaborative planning with the Australian Quarantine Inspection Service and port authorities is necessary during the pandemic alert phase. During the containment stage the public health unit will be responsible for case assessment and appropriate infection control. In addition, where a person meets the case definition, there will need to be active follow up of all fellow passengers and crew that meet the Australian Government definition of a contact that is current at that point in time.

SURGE CAPACITY AND WORKLOAD PRIORITISATION

A dramatically increased workload with potentially decreased staff numbers (due to sickness or family commitments) should be anticipated during a pandemic. All area health services, including the public health units, are expected to develop business continuity plans, and these plans will need to include a workforce plan that addresses the need to supplement staffing during a pandemic. Alternative practices such as working from home where feasible may assist whilst also reducing exposure risks. In addition, prior consideration should be given to identifying essential tasks that must be continued within the emergency.

EDUCATION AND COMMUNICATION

It is impossible to predict the degree of personal anxiety and social disruption during a pandemic event, but maintaining proactive communication will help.[7] Early preparation should include using diverse media outlets and forums to disseminate fact sheets and infection control advice to the public and health workers so that a relationship of trust is established prior to the pandemic.[8] To facilitate dissemination and receipt of information, public health units should establish communication systems including contact lists, contracts with telecommunication suppliers, menu driven telephone services, 1800 numbers, websites, fact sheets and fax alerts.

The public education message is primarily the responsibility of the Australian Government as this ensures uniformity of advice. These messages may need to be tailored at a state or local level, for instance by providing area-specific telephone numbers and the addresses of influenza clinics and other facilities. The public health unit will play a role in ensuring adequate local coverage has occurred.

PANDEMIC INFLUENZA IN RURAL COMMUNITIES

Population density is an important determinant of the spread of communicable diseases, hence influenza attack rates in rural communities, are expected to be lower than in urban settings. However, attack rates may be very high in specific communities, with a profound effect on medical and essential service infrastructure should key personnel be affected. Pandemic preparation and planning places a considerable additional burden on available health staff.[9] This is challenging in relatively well resourced metropolitan areas but even more demanding in country towns with fewer staff.

Planning to mitigate the impact of pandemic influenza in rural areas must address the issue of transporting people, personal protective equipment, antiviral therapy and vaccines over large distances within a short timeframe. This may require the adoption of innovative courier networks, including local transport companies, service agencies and volunteer groups.

Many rural areas have greater levels of socio-economic disadvantage and higher proportions of Aboriginal and Torres Strait Islander people. These communities may struggle during a pandemic, and planning should therefore ensure that their particular needs are considered.

DISCUSSION

Even with mathematical modeling and the lessons of history, it is impossible to predict the full impact of an influenza pandemic. Strategic planning should anticipate a profound disruption to social and health infrastructure. Currently, the focus of world attention is on a relatively small number of human cases of infection with the avian influenza H5N1 subtype, but the next pandemic strain may demonstrate distinctly different clinical and epidemiological features. Public health planning and preparation should be suitably adaptable to respond to evolving disease characteristics and challenging logistical situations. Indeed, the measure of a successful plan is its capacity to adapt to a range of serious infectious and environmental emergencies. This can only be achieved by meticulous planning and the practical experience gained through simulated exercises. Although a number of exercises have been organised and enacted at a local, state and national level, further exercises are necessary to practically test potentially fragile links in the response chain.

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FACT*SHEET*

AVIAN INFLUENZA ('BIRD FLU')

WHAT IS AVIAN INFLUENZA (BIRD FLU)?

Avian influenza is an infectious disease of birds, caused by a number of different strains of avian influenza virus. Usually the virus circulates in wild bird populations causing no disease or only mild disease. Infection of domestic poultry, such as chickens, can cause severe disease in these birds. There are a number of different strains of avian influenza, only a few of which can cause disease in humans.

A new type of avian influenza, called influenza A H5N1 (hereafter referred to as H5N1), was first recognised in 1997 in Hong Kong. This strain reappeared in late 2003 and has rapidly spread to many Asian, Middle-Eastern, European and African countries, causing severe infection in wild birds and domestic poultry flocks. There is no evidence that avian influenza is currently infecting birds in Australia.

This virus has also infected a number of people in Asia, the Middle East and Africa who had close contact with infected poultry or poultry droppings.

At this stage, humans infected with the H5N1 virus do not easily transmit the infection to others. Exposure to infected poultry, or their infected secretions or droppings, or dust or soil contaminated with their secretions or droppings, can result in human infection. Eating cooked poultry products including chicken or eggs does not result in infection.

A large-scale, worldwide influenza epidemic is called a pandemic. Pandemics occur when a new virus emerges to which people have little or no immunity. Previous influenza pandemics occurred in 1918-19, 1957-58 and 1968-69. In the 1918-19 pandemic, between 20 and 40 million people died. Many scientists are concerned that the recent H5N1 outbreak in birds could mutate to produce a new strain of influenza virus that is easily spread among people, resulting in a pandemic.

WHAT ARE THE SYMPTOMS?

Different strains of avian influenza can lead to different symptoms in people. All strains can cause symptoms typical of human influenza (fever, cough, tiredness, muscle aches, sore throat, shortness of breath, runny nose, headache). In some cases the H5N1 strain has caused a severe pneumonia and, in a small number of cases, encephalitis (inflammation of the brain) or diarrhoea. The most common symptom of humans infected with H7 strains of avian influenza is conjunctivitis (inflammation of the lining of the eye). Symptoms generally appear between two to four days following exposure.

WHO IS AT RISK?

Most people are not at risk of this disease. People at risk of becoming infected with H5N1 are those who come into contact with sick birds or their secretions or droppings while living or travelling in areas where the virus is circulating, or (possibly) people who have had close contact with a person with the human form of the disease in the affected areas. In the absence of a vaccine, the best method of prevention is to ensure that all people who are working with infected birds are supplied with appropriate personal protective equipment, such as masks, goggles, gloves and protective clothing, and, if necessary, anti-influenza medication.

HOW IS IT PREVENTED?

A human vaccine is not available for the new avian influenza strain. Existing vaccines for normal human influenza will not provide protection against avian influenza, including the H5N1 strain. Scientists worldwide are currently working to develop a suitable vaccine for this strain.

HOW IS IT DIAGNOSED?

Avian influenza virus infection can be diagnosed using specimens of blood, or from swabs of the nose and throat. Testing is done at a specialised laboratory.

HOW IS IT TREATED?

Specific anti-influenza drugs are likely to be effective against avian influenza in humans and are used to treat people with the H5N1 strain.

WHAT IS THE PUBLIC HEALTH RESPONSE?

Outbreaks of different strains of avian influenza have occurred previously in Australia. However, there have been no recent reports of avian influenza in Australian birds and there are no reports of Australian people with H5N1 virus infection. There is surveillance for the illegal importation of birds or bird products at Australian borders.

Human infection with avian influenza must be notified to the local public health unit. Should suspected human cases occur in NSW, the local public health unit would work with the patient, the treating doctors, and the laboratory to confirm the diagnosis. Suspected cases would be isolated from others to prevent further infections. Close contacts of these cases who may have been exposed to the virus will be given information about the risk of infection. Should these people also develop symptoms, they would also be isolated and tested for avian influenza.

TRAVEL ADVICE

Australians travelling to areas affected by avian influenza should reduce their risk of infection by avoiding poultry farms and live bird markets. They should also ensure that they wash their hands thoroughly after handling uncooked poultry products such as eggs, and that they ensure that poultry is cooked thoroughly before eating.

For more information contact the Australian Government Department of Health and Ageing information hotline 1800 004 599.

NSW HEALTH

COMMUNICABLE DISEASES REPORT, NEW SOUTH WALES, FOR MAY AND JUNE 2006

For updated information, including data and facts on specific diseases, visit www.health.nsw.gov.au and click on **Infectious Diseases.**

TRENDS

Tables 2 and 3 and Figure 1 show reports of communicable diseases received through to the end of May and June 2006 in NSW.

MEASLES UPDATE

The NSW measles outbreak that began with 10 cases in March 2006 and continued through April (29 cases) and May (16 cases) appears to have subsided, with two cases with onset in June. The most recently confirmed case (a young woman from South Eastern Sydney) was reported with onset in early June 2006.

Measles continues to circulate in many parts of the world; therefore outbreaks associated with infectious travellers are likely to continue to occur from time to time while people remain susceptible. Susceptible people are primarily those born after 1965 who have not received two doses of the measles, mumps and rubella (MMR) vaccine. Opportunistic promotion of vaccination for susceptible people (for example, during health checks before overseas travel) continues to be an important prevention strategy. The early notification of cases to the local public health unit assists in the early containment of outbreaks.

ENTERIC DISEASES

An outbreak of Clostridium perfringens food poisoning

In May 2006, the NSW Food Authority referred a complaint of food borne disease to the Liverpool office of the Sydney South West Area Health Service. The complainant reported that 70 of 90 people who attended a catered function at a community hall became sick with diarrhoea 7 to 14 hours after the function. The complainant was reluctant to provide any contact details of ill people as some family members had prepared food for the function. A number of Indian dishes including curries and rice were provided by a restaurant and family members. The NSW Food Authority tested some leftover food samples. One of the chicken curry samples from the restaurant was positive for *Clostridium perfringens*.

Clostridium perfringens occurs widely in the environment. *C. perfringens* food poisoning is caused by a toxin produced by the bacteria. Symptoms of *C. perfringens* poisoning are abdominal cramps and diarrhoea, usually without vomiting, occurring 6 to 24 hours after the meal. Most people recover within a day. Almost all outbreaks are caused by inadequately heated or reheated meat, particularly meat in casseroles, pies and gravies. Whilst we were unable to interview cases associated with this outbreak, a number of the features of this outbreak are classical for C. *perfringens*: the symptoms, the high attack rate, a catered event, the transport of food and subsequent reheating in a community hall, and confirmation of *C. perfringens* in the food sample.

Salmonellosis

There was an increase in salmonellosis caused by *Salmonella Typhimurium PT 135a* in May, with 11 cases reported compared with an average of four for May for the last five years. Interviews with cases did not reveal any common source.

Salmonellosis is caused by an infection with *Salmonella* bacteria. In Australia, most salmonellosis cases occur after eating contaminated food or occasionally after contact with another person or an animal infected with *Salmonella*. People with salmonellosis commonly develop headache, fever, abdominal cramps, diarrhoea, nausea and vomiting. Symptoms start 6 to 72 hours after infection and usually last 4 to 7 days, sometimes longer.

Approximately 2000 cases of salmonellosis are reported annually in NSW. In the last year or so, NSW and other Australian states have conducted a number of epidemiological investigations to examine the increases in notifications of particular *Salmonella* serovars. OzFoodNet, a national network for enhancing food borne disease surveillance and investigation, has coordinated many of the national studies. A number of exposures associated with increased risk for salmonellosis have been identified, including certain bakery products, alfalfa sprouts, and contact with ornamental fish, but most commonly the consumption of under-cooked chicken or eggs and their by-products.[1–3]

Thorough cooking of food kills *Salmonella*. Avoid raw or undercooked meat, poultry or eggs. Poultry and certain prepared meats—such as hamburgers, sausages, and rolled roasts—should not be eaten if pink in the middle.

Doctors, hospitals and laboratories must notify outbreaks of food borne disease to the local public health unit. The public health unit can advise on who should be excluded from work and school. Children in childcare should stay home for 24 hours after their diarrhoea has stopped. People who are food handlers or who care for children, the sick or the elderly, should avoid work for 48 hours after their diarrhoea has stopped.

If you have a complaint about a food business please contact the NSW Food Authority on 1300 552 406.

References

1. The OzFoodNet Working Group. OzFoodNet: enhancing food borne disease surveillance across Australia: Quarterly report, 1 October to 31 December 2005. *Commun Dis Intell* 2006; 30: 148–53.

2. The OzFoodNet Working Group. OzFoodNet: Quarterly report, 1 January to 31 March 2006. *Commun Dis Intell* 2006; 30: 228–32.
3. Musto J, Kirk M, Lightfoot D, Combs BG, Mwanri L. Multi-drug resistant *Salmonella Java* infections acquired from tropical fish aquariums, Australia 2003-04. *Commun Dis Intell* 2006; 30: 222–7.

PERTUSSIS IN A NURSERY

In June 2006, a pathology laboratory notified Sydney West Area Health Service of a case of pertussis in an 11-week-old infant. The infant had been an inpatient in the neonatal intensive care unit during the period that they acquired the infection. The public health unit initiated a search for possible sources of the infection and found that a number of staff members in the unit and special care nursery had had recent coughing illnesses. Seven health care workers were subsequently diagnosed with pertussis following clinical review and pathology testing. Another staff member who had symptoms was epidemiologically linked to the cluster. Based on the dates of cough onset and the common work places of the cases, at least three generations of disease transmission were identified in this outbreak.

Cases that were infectious were treated and excluded from work and all clinical staff working in the affected wards were given antibiotic prophylaxis to avert further infections. Unimmunised health care workers were offered pertussis booster vaccination. Other neonates who may have been exposed were given antibiotic prophylaxis. Surveillance for cough was instituted in staff, parents and babies.

This outbreak is an important reminder that many heath care workers are susceptible to pertussis and may transmit it to vulnerable patients. A single booster immunisation is recommended for all health care workers caring for infants and children. Health care workers who have a persistent cough should be investigated and, if necessary, treated for pertussis.

OUTBREAK OF A RESPIRATORY ILLNESS IN A RURAL TOWN IN SOUTHERN NEW SOUTH WALES IN FEBRUARY 2005

Kym Bush and Lisa Clarkson
Greater Southern Public Health Unit
Greater Southern Area Health Service

James Branley
Nepean and Blue Mountains Pathology Service

In February 2005 the Greater Southern Public Health Unit was notified by a local general practitioner from a rural town (population 4300) of eight people presenting with fever, dry cough and breathlessness in the preceding four weeks. Five of these cases had radiological evidence of pneumonia. The outbreak began during the week of the annual agricultural show and following the migration of a large number of black cockatoos into the area, raising concerns that it was caused by a zoonotic infection such as psittacosis or Q fever. The Greater Southern Public Health Unit investigated this apparent outbreak to identify its extent and possible cause.

Investigation

Patients with a diagnosis of atypical pneumonia were identified by contacting general practitioners from the surrounding area and reviewing the local hospital's inpatient and outpatient data.

A case was defined as any person from the area who presented with fever and cough and one other symptom with onset between 28 January and 7 March 2005.

In a case series study, the Greater Southern Public Health Unit interviewed cases using a standardised questionnaire to obtain information on demographics, any potential exposures to animals, onset and nature of symptoms, occupation, and laboratory tests.

Nose and throat swabs were collected from cases and couriered to the reference laboratory for psittacosis polymerase chain reaction (PCR), direct immunofluorescence for respiratory viruses and viral culture. Acute and convalescent serology (four weeks later) for antibodies to *Mycoplasma pneumoniae*, *Legionella, Chlamydophila psittaci*, *Coxiella burnetii*, adenovirus, and influenza A and B virus were also collected. Individuals with a fourfold or greater rise in antibody titre were considered as being recently infected. Urinary antigen for *Legionella pneumophila* and *Streptococcus pneumoniae* were also collected.

A site visit to the area was conducted and environmental samples (feathers, droppings, etc) from within the local showground and bird pavilions were collected for psittacosis PCR. Organisers of the local agricultural show were interviewed regarding the assortment of animals that had been brought into the area for the weekend prior to the start of the outbreak. Local veterinarians, council staff, National Parks and Wildlife staff and Wildlife Rescue Service workers were interviewed to determine whether there had been any sick or injured birds recently.

Results

Nineteen potential cases were identified through reporting by general practitioners and review of hospital inpatient and outpatient data for the five-week study period. Of these, 17 were interviewed. The remaining two, who had onset of symptoms on 28 January and 3 February 2005, were itinerant workers and could not be contacted. One potential case was diagnosed with asthma-associated pneumonia by a local paediatrician and was excluded.

The remaining 16 cases were included in the study. A review of the previous year's presentations to the hospital revealed that only three to four presentations of atypical pneumonia could be expected per month.

There were equal numbers of males and females. Four cases (25 per cent) were hospitalised and six cases (38 per cent) had pneumonia confirmed by chest x-ray. The age range of cases was 3 to 65 years (median – 22 years, mean – 26 years). Six cases were in children less than 11 years old. There appeared to be family clustering of cases, with two to four cases in each of two families. Fever and cough were reported by all cases. Other signs and symptoms were breathlessness (81 per cent), arthralgia (69 per cent), headache (56 per cent), malaise (38 per cent), sore throat (25 per cent), rales (25 per cent) and nausea (19 per cent).

Mycoplasma IgM was positive in three cases. *Bordetella pertussis* was detected by whole cell IgA EIA in one case. Seven paired sera were tested but one pair was anti-complementary and was unable to be tested. A fourfold rise in antibody titre was seen in one of the paired sera for *Chlamydophila psittaci*. One case had a persistently raised Q fever phase 2 antibody. All nose and throat swabs were culture negative. All nose and throat swabs and environmental swabs were *Chlamydia* PCR negative (for both genus and *psittaci* specific).

Discussion

It appears that this cluster of respiratory illness was due to several different infections, possibly including mycoplasmosis, pertussis, psittacosis and Q fever, and did not have a common cause. Initial concerns of a zoonotic outbreak linked to the annual agricultural show or black cockatoos were not substantiated.

Previously reported outbreaks of psittacosis have been associated with aviaries, pet shops or poultry processing plants and also linked to wild birds.[1,2] Psittacine birds such as parrots, cockatiels and parakeets that are infected with *C. psittaci* can spread the bacteria in droppings and in dust contaminated with infected droppings. The organism can remain viable in the environment and humans can then inhale the bacteria, causing infection.[2]

The setting of this outbreak shares some important characteristics with the Blue Mountains area, where an outbreak of psittacosis occurred in 2002.[2] It is high in altitude (approximately 1000 metres above sea level), surrounded by bushland and relatively sparsely populated by humans. This outbreak also had commonalities with the initial outbreak of community-acquired psittacosis in Bright, Victoria in 1995.[1] To help exclude psittacosis as the diagnosis in this investigation we used psittacosis PCR rather than serologic diagnosis of chlamydial infections, which lack specificity. These results were available within days of the commencement of the investigation. It is of note that there were also features of this outbreak that made psittacosis less likely as the diagnosis: the family clustering and the involvement of children as well as the equal sex distribution were not features of the previous outbreaks and suggested a pathogen that was transmitted from human-to-human.

Despite the lack of a unifying diagnosis, this investigation was important for allaying concerns of the community and highlighted the use of more rapid diagnostic modalities such as PCR and antigen detection to help exclude pathogens in an outbreak setting.

References

1. Williams J, Tallis G, Dalton C, Ng S, Beaton S, Catton M et al. Community outbreak of psittacosis in a rural Australian town. *Lancet* 1998; 351: 1697–9.
2. Telfer BL, Moberley SA, Hort KP, Branley JM, Dwyer DE, Muscatello DJ et al. Probable psittacosis outbreak linked to wild birds. *Emerg Infect Dis* (serial on the internet). March 2005. Available from: www.cdc.gov/ncidod/EID/vol11no03/04-0601.htm. Accessed 8 October 2006.

QUARTERLY REPORT: AUSTRALIAN CHILDHOOD IMMUNISATION REGISTER

Table 1 compares the percentages of fully immunised Indigenous and non-Indigenous children in NSW aged 12 months to less than 15 months in each area health service, reported by all service providers.

These data refer to children whose age has been calculated 90 days before data extraction. The information contained in the report has been extracted from the Australian Childhood Immunisation Register and may be underestimated by approximately three per cent due to children being vaccinated late, or to service providers failing to forward information to the Australian Childhood Immunisation Register.

TABLE 1

PERCENTAGE OF FULLY IMMUNISED CHILDREN AGED 12 MONTHS TO LESS THAN 15 MONTHS, BY AREA HEALTH SERVICE, AND BY INDIGENOUS AND NON-INDIGENOUS STATUS, FOR DECEMBER 2005 TO JUNE 2006

	31/12/2005		31/03/2006		30/06/2006	
	Non-Indigenous %	Indigenous %	Non-Indigenous %	Indigenous %	Non-Indigenous %	Indigenous %
Area Health Service						
Greater Southern	94	91	92	78	91	83
Greater Western	90	85	90	83	90	79
Hunter / New England	93	86	93	84	93	87
North Coast	86	83	85	80	85	83
Northern Sydney / Central Coast	91	97	90	95	91	88
South Eastern Sydney / Illawarra	91	90	90	95	91	86
Sydney South West	89	89	90	82	89	78
Sydney West	90	84	89	90	90	79
NSW	**91**	**88**	**90**	**84**	**90**	**83**
AUSTRALIA	**91**	**86**	**90**	**85**	**91**	**84**

FIGURE 2

REPORTS OF SELECTED COMMUNICABLE DISEASES, NSW, JAN 2001 TO MAY 2006, BY MONTH OF ONSET

Preliminary data: case counts in recent months may increase because of reporting delays.

Laboratory-confirmed cases only, except for measles, meningococcal disease and pertussis

BFV = Barmah Forest virus infections,
RRV = Ross River virus infections

Lab conf = laboratory confirmed

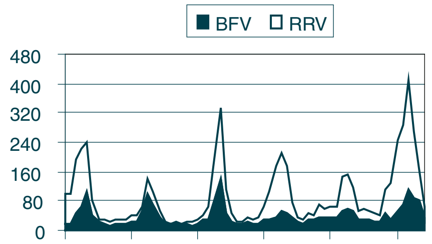
Men Gp C and Gp B = meningococcal disease due to serogroup C and serogroup B infection, other/unk = other or unknown serogroups.

NB: multiple series in graphs are stacked, except gastroenteritis outbreaks.

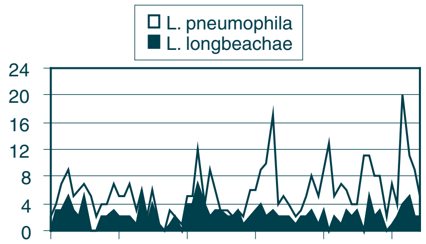
NB: Outbreaks are more likely to be reported by nursing homes and hospitals than by other institutions

NSW population	
Male	50%
<5 yrs	7%
5–24 yrs	27%
25–64 yrs	53%
65+ yrs	13%
Rural	46%

Apr 06–Jun 06	
Male	51%
<5	0%
5–24	10%
25–64	79%
65+	11%
Rural	92%



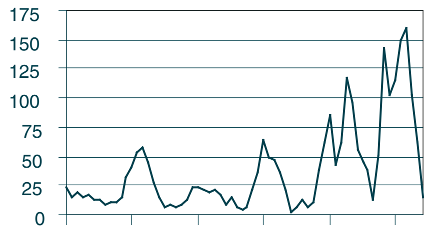
Arbovirus



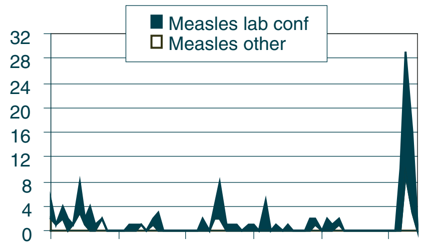
Legionellosis

Apr 06–Jun 06	
Male	68%
<5	0%
5–24	0%
25–64	44%
65+	56%
Rural	32%

Apr 06–Jun 06	
Male	46%
<5	39%
5–24	18%
25–64	42%
65+	1%
Rural	40%



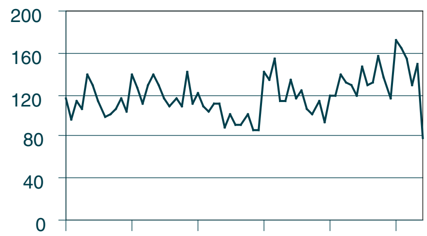
Cryptosporidiosis



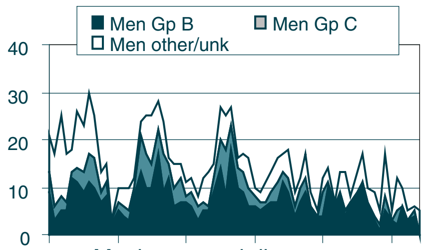
Measles

Apr 06–Jun 06	
Male	35%
<5	33%
5–24	37%
25–64	30%
65+	0%
Rural	13%

Apr 06–Jun 06	
Male	83%
<5	0%
5–24	32%
25–64	68%
65+	0%
Rural	15%



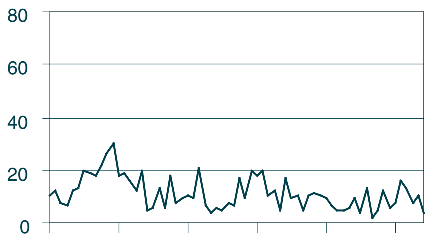
Gonorrhoea



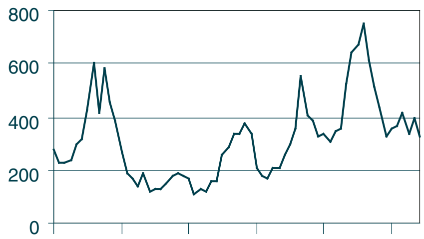
Meningococcal disease

Apr 06–Jun 06	
Male	38%
<5	44%
5–24	37%
25–64	19%
65+	0%
Rural	25%

Apr 06–Jun 06	
Male	50%
<5	9%
5–24	41%
25–64	32%
65+	18%
Rural	23%



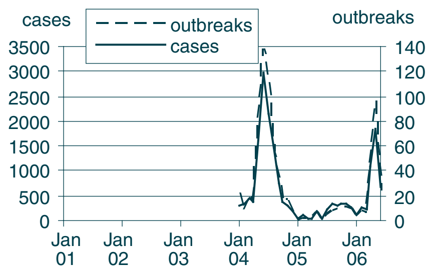
Hepatitis A



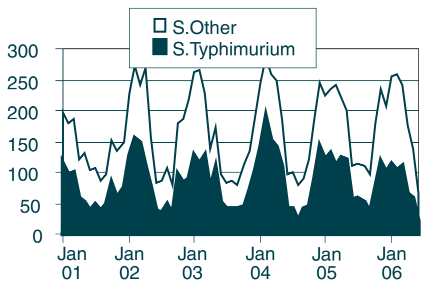
Pertussis

Apr 06–Jun 06	
Male	40%
<5	4%
5–24	12%
25–64	69%
65+	15%
Rural	30%

Apr 06–Jun 06	
All outbreaks	144
Nursing homes	100
Hospitals	25
Child care	18
Schools	0
Other	1



Gastroenteritis outbreaks in institutions



Salmonella infections

Apr 06–Jun 06	
Male	53%
<5	35%
5–24	25%
25–64	30%
65+	10%
Rural	39%

TABLE 2 REPORTS OF NOTIFIABLE CONDITIONS RECEIVED IN MAY 2006 BY AREA HEALTH SERVICES

	Area Health Service (2006)																		Total	
	Greater Southern		Greater Western			Hunter / New England		North Coast		Northern Syd / Central Coast		South Eastern Syd / Illawarra		Sydney South West		Sydney West				
Condition	**GMA**	**SA**	**FWA**	**MAC**	**MWA**	**HUN**	**NEA**	**MNC**	**NRA**	**CCA**	**NSA**	**ILL**	**SES**	**CSA**	**SWS**	**WEN**	**WSA**	**JHS**	**for May+**	**To date+**
Blood-borne and sexually transmitted§																				
Chancroid*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chlamydia (genital)*	50	17	2	12	27	131	35	39	51	44	66	49	175	100	59	34	76	3	985	5095
Gonorrhoea*	-	1	-	-	-	7	1	-	-	2	9	7	58	24	8	1	12	1	134	766
Hepatitis B–acute viral*	-	-	-	-	-	1	-	-	-	-	-	1	1	1	-	-	-	-	4	23
Hepatitis B–other*	5	3	-	-	-	2	2	6	2	2	2	6	50	48	77	8	55	3	274	1287
Hepatitis C–acute viral*	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	2	4	27
Hepatitis C–other*	11	11	-	11	12	45	10	13	27	20	-	22	57	54	77	8	37	15	445	2710
Hepatitis D–unspecified*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2	5
Syphilis	-	-	1	-	-	2	4	-	3	1	-	-	21	21	18	2	4	2	80	359
Vector-borne																				
Barmah Forest virus*	-	2	-	-	-	16	4	26	25	5	-	1	-	-	-	-	-	-	79	396
Ross River virus*	2	-	1	5	1	22	7	16	24	10	4	-	3	-	4	6	2	-	107	1027
Arboviral infection (other)*	-	-	-	-	-	-	-	-	1	-	-	-	2	-	-	1	-	-	4	26
Malaria*	-	-	-	-	-	2	-	-	-	-	-	1	-	1	-	1	1	-	6	48
Zoonoses																				
Anthrax*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Brucellosis*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Leptospirosis*	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	2	12
Lyssavirus*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Psittacosis*	1	1	-	-	1	3	-	-	-	-	-	-	-	1	-	1	-	-	8	47
Q fever*	-	-	-	3	1	1	-	1	-	-	-	3	-	-	-	-	-	-	9	65
Respiratory and other																				
Blood lead level*	-	-	-	3	2	8	-	1	-	-	1	1	1	1	1	2	-	-	22	133
Influenza*	1	-	-	-	-	-	-	1	1	-	1	2	5	-	-	-	2	-	13	154
Invasive pneumococcal infection*	-	4	-	-	4	8	-	-	-	3	6	3	3	3	8	4	12	-	58	174
Legionella longbeachae infection*	1	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	3	15
Legionella pneumophila infection*	-	-	-	-	-	2	-	-	-	-	-	1	-	-	1	-	2	-	6	31
Legionnaires' disease (other)*	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	2
Leprosy	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Meningococcal infection (invasive)*	-	-	-	-	-	-	-	-	1	-	2	-	-	1	1	-	2	-	7	41
Tuberculosis	-	1	1	-	-	1	-	-	-	1	2	-	5	1	1	1	7	-	21	166
Vaccine-preventable																				
Adverse event after immunisation (AEFI)**	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	1	2	-	5	35
H. Influenzae b infection (invasive)*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Measles	1	-	-	-	-	1	-	1	1	-	1	1	5	4	1	7	-	-	23	54
Mumps*	-	-	-	-	-	-	-	-	1	-	5	-	2	1	1	2	2	-	14	41
Pertussis	23	10	2	8	6	31	3	10	15	12	48	15	57	38	50	18	54	-	401	1942
Rubella*	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	7
Tetanus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Enteric																				
Botulism	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cholera*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cryptosporidiosis*	3	1	-	1	2	12	3	1	7	1	19	5	16	6	6	5	5	-	93	622
Giardiasis*	6	2	-	4	-	15	4	4	-	8	29	9	24	9	10	4	15	-	144	868
Haemolytic uraemic syndrome	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9
Hepatitis A*	-	-	-	-	-	-	-	-	1	1	-	-	2	-	2	-	4	-	10	57
Hepatitis E*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
Listeriosis*	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	13
Salmonellosis*	5	4	2	8	7	12	8	3	8	1	20	5	31	10	21	6	13	-	164	1129
Shigellosis*	-	-	-	-	-	-	-	-	1	-	1	1	1	-	2	-	-	-	6	39
Typhoid*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2	11
Verotoxin producing *E. coli**	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	3	10
Miscellaneous																				
Creutzfeldt-Jakob disease	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	2	7
Meningococcal conjunctivitis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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TABLE 3 REPORTS OF NOTIFIABLE CONDITIONS RECEIVED IN JUNE 2006 BY AREA HEALTH SERVICES

	Area Health Service (2006)																		Total	
	Greater Southern		Greater Western			Hunter / New England		North Coast		Northern Syd / Central Coast		South Eastern Syd / Illawarra		Sydney South West		Sydney West				
Condition	GMA	SA	FWA	MAC	MWA	HUN	NEA	MNC	NRA	CCA	NSA	ILL	SES	CSA	SWS	WEN	WSA	JHS	for June+	To date+
Blood-borne and sexually transmitted[§]																				
Chancroid*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chlamydia (genital)*	46	30	-	17	28	123	29	33	40	43	96	39	185	83	53	25	87	3	974	6169
Gonorrhoea*	-	-	-	-	3	11	1	7	2	-	15	2	51	13	12	4	16	-	139	921
Hepatitis B–acute viral*	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	3	26
Hepatitis B–other*	4	1	-	-	-	4	2	1	1	8	20	1	42	32	67	4	61	1	251	1598
Hepatitis C–acute viral*	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	2	27
Hepatitis C–other*	14	3	-	7	12	51	13	24	18	24	11	12	48	38	64	22	40	24	433	3238
Hepatitis D–unspecified*	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	2	-	4	9
Syphilis	-	1	-	2	4	1	3	7	2	1	4	3	18	9	12	3	12	-	84	435
Vector-borne																				
Barmah Forest virus*	2	1	-	-	1	13	1	14	15	3	2	-	1	-	-	-	-	-	53	452
Ross River virus*	4	1	-	-	-	8	-	13	6	-	3	-	4	-	-	1	2	-	42	1075
Arboviral infection (other)*	-	-	-	-	-	-	-	-	2	-	-	-	1	-	-	-	-	-	3	29
Malaria*	1	-	-	-	-	1	-	-	2	-	3	1	6	3	-	-	1	-	18	68
Zoonoses																				
Anthrax*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Brucellosis*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Leptospirosis*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14
Lyssavirus*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Psittacosis*	-	1	-	-	-	-	-	1	-	-	-	2	-	1	-	-	-	1	6	53
Q fever*	-	3	-	3	3	3	2	1	3	-	-	-	1	-	-	-	-	-	19	84
Respiratory and other																				
Blood lead level*	-	-	-	5	1	1	-	-	-	1	2	-	2	-	-	-	-	-	12	176
Influenza*	-	2	-	-	-	-	-	-	2	-	3	2	5	-	-	2	4	-	20	180
Invasive pneumococcal infection*	2	3	-	-	3	10	1	2	10	4	8	5	1	9	7	2	10	-	77	253
Legionella longbeachae infection*	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	1	-	3	18
Legionella pneumophila infection*	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	1	1	-	5	40
Legionnaires' disease (other)*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Leprosy	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Meningococcal infection (invasive)*	-	-	-	-	-	3	-	-	-	-	2	-	-	-	1	-	-	-	6	46
Tuberculosis	1	-	-	-	-	4	-	1	-	-	7	-	7	1	8	-	4	-	33	217
Vaccine-preventable																				
Adverse event after immunisation (AEFI)**	2	-	-	-	1	-	-	-	-	-	-	-	-	-	-	2	-	-	5	44
H. Influenzae b infection (invasive)*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	2
Measles	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	1	-	3	56
Mumps*	1	-	-	-	1	2	-	1	1	-	3	1	1	1	2	1	4	-	19	62
Pertussis	21	8	-	16	7	34	8	4	6	3	44	15	52	26	64	22	72	-	403	2360
Rubella*	-	-	-	-	-	1	-	-	-	-	1	-	2	1	2	-	-	-	7	14
Tetanus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Enteric																				
Botulism	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cholera*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cryptosporidiosis*	-	3	-	-	-	4	-	1	2	2	2	2	7	-	-	-	1	-	24	647
Giardiasis*	1	5	-	2	2	11	6	6	2	4	24	6	20	7	8	2	11	-	117	998
Haemolytic uraemic syndrome	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	10
Hepatitis A*	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-	1	-	4	63
Hepatitis E*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	5
Listeriosis*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13
Salmonellosis*	3	2	-	2	1	6	3	3	9	4	15	3	15	5	10	6	11	-	98	1238
Shigellosis*	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	2	43
Typhoid*	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	1	-	3	14
Verotoxin producing *E. coli**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10
Miscellaneous																				
Creutzfeldt-Jakob disease	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	8
Meningococcal conjunctivitis	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	1

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