

INFECTIOUS HUMAN DISEASE PANDEMICS

Infectious disease pandemics are characterised by the global spread of a new type of virus that can cause unusually high rates of illness and mortality for an extended period of time. Most people are not immune to a new virus and are therefore susceptible to infection. A pandemic can overwhelm the resources of a society due to the exceptional number of people affected. A new strain of the influenza virus is the most likely cause of the next infectious disease pandemic.

Influenza

The influenza virus

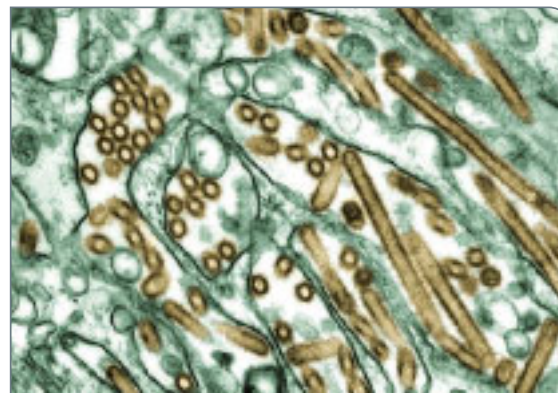
The influenza virus infects the respiratory tract, causing fever, aches and fatigue for around 7–10 days, and sometimes secondary infections such as pneumonia. The virus is easily spread from person to person through droplets and hand to mouth transmission, and can be fatal. The incubation period is generally 1–3 days but can be up to 7 days. Minor influenza outbreaks (epidemics) typically occur during winter and influenza is directly responsible for around 100 deaths each year in New Zealand.

There are three types of influenza virus – A, B and C. Influenza C viruses only cause mild symptoms and are not thought to generate epidemics, whereas influenza A and B viruses can cause epidemics. Influenza B viruses are only found in humans, but influenza A viruses, responsible for pandemics, are found in humans and many different animals including birds, pigs, whales, horses, and seals.

Influenza A viruses are divided into subtypes based on the

hemagglutinin (H) and neuraminidase (N) proteins on the surface of the virus. There are 15 different H subtypes and nine different N subtypes, all of which have been found among influenza A viruses in wild birds.

Influenza A and B viruses continually change over time through antigenic drift, which occurs when small changes in the virus create new strains. People may have some degree of immunity to these new strains as they are similar to previous ones. Influenza A viruses can also undergo antigenic shift. This is an infrequently occurring abrupt major change in the virus resulting in new H or N proteins and the formation of a new influenza A subtype. This process can occur within humans or other animals, such as pigs, if they are infected with two different types of virus at the same time. Most people have little or no immunity against the new virus, and developing a vaccine for a new virus can take 6–9 months.



A coloured transmission electron micrograph of the H5N1 Avian influenza virus. *Center for Disease Control.*

Influenza pandemics

An influenza pandemic is generated when a new type of influenza virus evolves which causes illness in humans and is efficiently transmitted between people, spreading rapidly around the globe. Pandemic influenza is different from seasonal influenza – it can occur at any time of year and can affect any age group, not just the young or elderly.

The emergence of several new influenza A virus subtypes caused three pandemics last century, all of which spread around the world within a year of being clinically recognised.

The 1918/19 'Spanish flu', A(H1N1), was the most severe pandemic causing between 50 and 100 million deaths worldwide with a large impact in New Zealand. The 1957/58 'Asian flu', A(H2N2), and the 1968/69 'Hong Kong flu', A(H3N2), each killed one to four million people worldwide. The 1957/58 pandemic infected 70–80 per cent of New Zealanders but the mortality rate was very low, and the 1968/69 pandemic had little effect in New Zealand.

Both the 1957/58 and 1968/69 pandemics were caused by viruses containing a combination of genes from a human influenza virus and an avian influenza virus. The 1918/19 pandemic virus appears to have been completely avian in origin.

1918 INFLUENZA PANDEMIC

The 1918 pandemic arrived in New Zealand in early October 1918 and had a profound effect on the country, which took years to recover. Many people died within the first few days after infection and others died of secondary infections like pneumonia. Little was known about the cause of the disease or how it spread, and a variety of ineffective treatments such as public throat-spray facilities, while well-meaning, may have created additional sources of cross-infection. Quarantining and travel restrictions around the country were not introduced until the pandemic was well under way. Public health knowledge was limited and in each community doctors were totally overwhelmed; there was ultimately little they could do to halt the course of the influenza in those who contracted it. Communities formed groups and committees to look after those most in need with food or home help, and it seems that without this basic care even more could have died.

Within 4 months, 30–50 per cent of the population had contracted the virus and 8600 had died, nearly half of whom were young, healthy adults. Because it occurred at the end of World War I the trauma suffered was masked, but in many ways it was more damaging than the effects of the war itself.

The 1918 pandemic had a severe impact on Māori, whose death rate of 4.2 per cent (a total of 2160) was around six times higher than non-Māori. Possible explanations for this difference have included inequalities in socio-economic status, lack of access to health care, and a higher incidence of other illnesses at the same time. Some of these factors still exist today, potentially making the Māori population more vulnerable in the event of a pandemic.



An influenza medicine depot in Cathedral Square, Christchurch, during the 1918 influenza pandemic. The pandemic was the worst disease outbreak to hit New Zealand and prompted reforms to the health system, including the 1920 Health Act. *Alexander Turnbull Library.*

New Zealand's pandemic hazard

Another pandemic will occur in the future but there is no certainty about when or how large it will be, or where it will originate. New Zealand has some advantages in being a geographically isolated country with a limited number of well-controlled entry points. Depending on the nature of a pandemic it may, therefore, be possible to delay the impact in New Zealand, but the effects would still be significant.

Current influenza viruses

There are currently five different types of new influenza A virus that have caused human infections. One virus, H5N1, is an avian influenza virus that, since 2003 in particular, has been infecting birds in an increasing number of countries. It has also caused severe human disease although so far it has been reported as only affecting a relatively small number of people. Should a virus such as H5N1 mutate to become easily and readily transmissible between humans it would represent a credible and potentially serious pandemic threat.

The World Health Organisation uses six phases of pandemic alert level to convey the seriousness of the pandemic threat and the need to launch progressively more intense preparedness activities. Phases range from 1 (interpandemic phase: low risk of human cases) to 6 (pandemic: efficient and sustained human-to-human transmission). The current status is phase 3 (pandemic alert: no or very limited human-to-human transmission) as at September 2006, in response to the H5N1 avian influenza situation.

New Zealand pandemic planning model

It is not possible to predict what will happen in New Zealand if a pandemic occurs, because that will depend on the nature of the new virus, which cannot be known until it exists. However, New Zealand has adopted a pandemic planning model, based on World Health Organisation guidelines and the impacts of the 1918 epidemic, to assist in pandemic planning.

The model assumes a pandemic wave in which 40 per cent of New Zealand's population, around 1.6 million people, become ill over an 8-week period. The peak incidence is over weeks 3 to 5 when about 1.3 million people, or a third of the population, would be ill, convalescent or just recovered.

The model assumes a fatality rate of two per cent of those infected, which would see about 33 000 deaths over the eight-week period, peaking at about 10 000 in week 4, compared to around 550 deaths per week normally.

Pandemic impacts

In contrast to many other hazards, the impacts of a pandemic manifest as a loss of human capability. They affect the ability of society and the economy to function normally, and can indirectly lead to a subsequent deterioration of infrastructure services. These impacts would occur on a national and international level. Consequently a greater degree of community resilience is required, compared to the response for other hazards, because assistance is unlikely to be available from outside affected areas.

A pandemic is likely to cause high absentee rates in the workforce as people fall ill or stay at home to care for the sick. The planning assumption used in New Zealand is for up to 50 per cent absenteeism

at the peak of an epidemic. This would significantly affect all services including health and other essential services such as police, fire, transportation, communications and CDEM organisations.

Other services and supplies – including food, water, gas, electricity supplies, educational facilities, postal services and sanitation – are also likely to be affected. Food shortages are possible if food distribution and shopping is affected. A heavy load is likely on information and communication technology infrastructure as people work and interact from home.

National and international business activities, regardless of their nature, are likely to suffer during a pandemic. A serious pandemic is likely to have severe adverse short-term effects on the economy. Uncertainty about how serious any pandemic may turn out to be, how long it may last, and when communities may regain daily functioning, would have a major effect on business and consumer confidence. Such confidence effects are likely to play a major role in how severe the economic impact is, and in how quickly the economy can recover afterwards. Based on the pandemic planning model Treasury has estimated a reduction in GDP of 5–10 per cent in the year of the pandemic and cumulative losses over 4 years of 10–15 per cent of one year's GDP.

Managing pandemics

The Ministry of Health is the lead agency for managing pandemics. The Ministry of Health has led the development of the New Zealand Influenza Pandemic Action Plan that provides a consistent framework for pandemic management in New Zealand. The plan is built around a five-stage strategy to:

- plan for it – reduce the health, social and economic impact
- keep it out – prevent, or delay to the greatest extent possible, its arrival

- stamp it out – control or eliminate any clusters that are found
- manage it – reduce the impact on the population
- recover from it – speed the recovery of health, communities and society.

Managing the pandemic hazard involves a whole-of-government approach, and early, decisive leadership is critical in the event of a pandemic.

Risk reduction and readiness

MONITORING

An ongoing effective national surveillance system is an essential component of preparedness. There are currently two national surveillance systems in New Zealand.

The general-practice sentinel disease and virological surveillance system, involving more than 90 practices throughout New Zealand, operates annually during winter (May to September), recording the daily number of consultations that fit the case definition of an influenza-like illness.

In addition, specimens are collected from hospitalised patients with an influenza-like illness throughout the year for analysis at designated virology diagnostic laboratories. Data collected from these laboratories is reported nationally in the Virology Weekly Report. Authorities in New Zealand maintain contact with the World Health Organization Collaborating Centre for Reference and Research on Influenza in Melbourne.

Internationally, the Global Outbreak Alert and Response Network is a technical collaboration of institutions and networks who pool human and technical resources for the rapid identification, confirmation



People receiving a dose of zinc sulphate in an inhalation chamber in Christchurch during the 1918 influenza pandemic. Such treatments probably did more harm than good by bringing people together. Social distancing would be encouraged in any future pandemic. *Alexander Turnbull Library.*

and response to outbreaks of international importance. The Network provides an operational framework to link expertise and skill, keeping the international community constantly alert to the threat of outbreaks and ready to respond.

COMMUNICATION AND PUBLIC EDUCATION

An important element of reducing the impact of a pandemic and maintaining readiness for one is to raise people's awareness of the threat and prepare them for it by suggesting actions that can be taken to mitigate the threat. This includes informing people about community self-support, and advising them of good infection prevention and control practices to promote good hygiene and prevent cross-infection. Important messages include covering coughs and sneezes and keeping a distance of at least one metre from other people where at all possible.

People are encouraged to have a well-stocked emergency supplies kit, including food for a period of at least 10 days, along with a plan that includes how they will manage if they live on their own and are unwell, identification of pre-arranged contacts, and having a way to call for help and to offer help to neighbours.

BUSINESS CONTINUITY PLANNING

Organisations will need robust arrangements for continuing their business in the event of a pandemic. A pandemic represents a particular challenge for business continuity planning, which will need to include staff welfare, solutions for working in an environment of 'social distancing', managing large-scale absenteeism, maintaining continuity of senior management roles and management systems, realigning business activities to focus on critical functions and services, and identifying any additional roles in responding to the pandemic.

Response

A range of control measures may prevent, eliminate, or slow down transmission of an influenza virus, in the hope that it would allow time for the development and arrival of a pandemic vaccine. These traditional public health measures include border management, intensified surveillance, early detection and isolation of cases and quarantine of contacts, use of antivirals, restriction of public gatherings, and closure of educational institutions.

The particular pandemic control interventions that will be adopted depend on the nature and stage of the pandemic, the severity of disease (a more virulent strain will justify more socially demanding measures), and the extent of transmission within the country and community. In general, as a pandemic develops, the strategy changes from individual interventions, such as finding and identifying cases, tracing contacts, prevention and quarantine, to more population-wide actions, and managing their impacts.

In a severe pandemic, alternatives to providing a regular health service may be required as primary and secondary health services struggle to cope with the increased demand for services. Community-based assessment centres may be established as a means of concentrating the initial assessment of people who may have the pandemic influenza virus away from individual general practices and hospital emergency departments. They may also distribute antivirals or antibiotics to those who meet agreed clinical criteria, support home-based self-care and advice, and refer patients to the hospital if clinical interventions are required.

It is expected, however, that even in a substantial pandemic most people will suffer uncomplicated influenza, which will resolve itself. Self-management at home can be safe and effective if good information is available to the public on how to look after themselves and others, how to identify complications, and how to seek advice

if complications occur.

Planning and coordination by the CDEM sector, as noted in the New Zealand Influenza Pandemic Action Plan, can help support the health sector and local government in community leadership and in managing community services and assets. It also supports the 'fast moving consumer goods' sector to maintain essential food and grocery supplies.

Recovery

The recovery from a pandemic will be a very long process involving complex global issues. In particular, New Zealand's economy is strongly linked to international economies which will also be affected, prolonging economic recovery. On a national level a pandemic will affect the physical, financial and emotional wellbeing of large numbers of people who may suffer bereavement, severe illness or separation from families and support. People may also experience losses of employment and income along with social and community isolation. Recovery strategies therefore need to be based primarily around social and economic initiatives.

FURTHER INFORMATION

GENERAL PANDEMIC INFORMATION

MINISTRY OF HEALTH

www.moh.govt.nz/pandemicinfluenza

NEW ZEALAND INFLUENZA PANDEMIC ACTION PLAN 2006

MINISTRY OF HEALTH

www.moh.govt.nz/moh.nsf/indexmh/nz-influenza-pandemic-action-plan-2006

LOCAL GOVERNMENT AND CDEM GROUP PANDEMIC PLANNING GUIDE

MINISTRY OF CIVIL DEFENCE & EMERGENCY MANAGEMENT

www.civildefence.govt.nz/memwebsite.nsf/wpg_URL/For-the-CDEM-Sector-Readiness-and-Response-Pandemic-Influenza

BUSINESS CONTINUITY PLANNING AND WORKPLACE ISSUES

DEPARTMENT OF LABOUR

www.dol.govt.nz/initiatives/workplace/pandemic/index.asp

MINISTRY OF ECONOMIC DEVELOPMENT

www.med.govt.nz/templates/ContentTopicSummary___14451.aspx

IMPACTS OF AN INFLUENZA PANDEMIC ON NEW ZEALAND'S MACROECONOMY

THE TREASURY

www.treasury.govt.nz/workingpapers/2006/tpp06-03.pdf

VIROLOGICAL SURVEILLANCE

ENVIRONMENTAL SCIENCE AND RESEARCH

www.surv.esr.cri.nz/virology/virology.php

1918 INFLUENZA EPIDEMIC IN NEW ZEALAND

NEW ZEALAND'S HISTORY ONLINE

www.nzhistory.net.nz/culture/influenza-pandemic

RICE, G, 2005, BLACK NOVEMBER: THE 1918 INFLUENZA EPIDEMIC IN NEW ZEALAND.

Canterbury University Press, Christchurch.

WORLD HEALTH ORGANISATION PANDEMIC ALERT PHASES

WORLD HEALTH ORGANISATION

www.who.int/csr/disease/avian_influenza/phase/en/index.html