

RISK PROFILE – COMMUNICABLE DISEASE (HUMAN)

Priority: Identifying and managing cross-agency pandemic readiness within the Inter-agency Pandemic Group

Gap: The management of pandemic risk is well understood and managed by the Ministry of Health however; the risk requires ongoing management of cross-agency readiness.

Action: The Ministry of Health is leading a Pandemic Readiness Work Programme including a four-part series of national exercise programmes (Exercise POMARE).

By When: Underway; National Exercise Programmes scheduled for 23 November, 21 February, and 21 March.

Rating: Very High

Risk-Owning Agency:

The Ministry of Health

Shock/Stress Description

Context

Communicable diseases events may affect small clusters of people leading to localised outbreaks or result in more widespread epidemics. When a disease epidemic becomes very widespread and affects a whole region, continent or the world it is known as a pandemic. Management of communicable disease is complex. Outbreaks of vaccine preventable communicable diseases, such as Measles, still occur because of under immunisation in vulnerable populations whilst broader determinants of public health may increase risk of certain communicable diseases especially in areas of high population density. Emerging Infectious Diseases events, such as SARS, MERS-CoV, Zika Virus and Ebola Virus have all demonstrated the inherent difficulties in determining the actual risk and epidemiology of a new or re-emerging disease.

The impact of a communicable disease depends on the affected population's susceptibility to it, disease characteristics such as incubation, mechanism of transmission and whether it is infective before symptoms present, and the effectiveness of prophylaxis, treatment and public health interventions that may be implemented in reduction or response activity.

New Zealand continues to experience small, yet significant outbreaks of measles, following introductions from overseas. New Zealand is at risk of frequent measles importations due to travel to and from countries where measles is endemic.

An influenza pandemic is the most likely event to cause a large-scale health emergency. Influenza pandemics are characterized by the global spread of a novel type of virus. They may cause unusually high morbidity and mortality as people are immunologically naïve to the virus.

The WHO advises that the risk of pandemics has recently increased due to the increase in the human population, the closer proximity of humans and animals in rural and urban settings and the increased speed and frequency of travel.

Magnitude

Units: R_0 (reproductive value in an immunologically naïve population), attack rate, case fatality rate, immunisation rate and vaccination rate

Extent: Unless an individual has been immunised or has previously had a specific disease and retains immunity they are susceptible. High levels of immunisation in a population, provide 'herd immunity' and prevent a disease from growing exponentially. It also reduces the likelihood that someone who cannot be immunised (for example due to a reduced immune system during cancer treatment) contracts the disease. The vaccination rate for herd immunity varies based on the R_0 of the specific disease, however regardless of immunisation levels all non-immunised individuals remain vulnerable.

For vaccine preventable diseases the extent will be heavily influenced by vaccination levels for the community affected. A global influenza pandemic is particularly serious as by definition the majority of the world population is immunologically naïve and it will take at least 6 months to develop and begin specific vaccine manufacturing.

Risk Analysis

Likelihood/Probability (Based on Maximum Credible Event)

Likelihood Score: **3**

Maximum Credible Event: The New Zealand Influenza Pandemic Plan incorporates a Standard Planning Model (SPM) which is based on the 1918/19 Spanish flu pandemic. This model used is a severe initial pandemic wave in which 40% of the New Zealand population (more than 1.6 million people) become ill over an 8 week period. The model assumes a case fatality rate of 2%, with 33,000 deaths occurring during the 8 week period. A worst case scenario would involve higher case fatality rates, including the likelihood that some population groups would be affected more severely than other.

The peak incidence in the SPM occurs in weeks three to five, when about a third of the New Zealand population would be ill, convalescing or just recovered. Influenza pandemics are naturally occurring events and it is almost certain that another pandemic will occur over time. Based on three pandemics in the 20th Century, 1918, 1957 and 1968, the annual estimated likelihood of a pandemic in the next five years is between 10 and 20%.

A severe pandemic would have serious adverse short term effects on the economy and on most individual businesses. Treasury modelling in 2006 suggested an impact of \$5-6bn in the first year and economic disruption of 1-2% of GDP in a mild pandemic (such as in 1957 or 1968) whilst a severe pandemic (as per 1918) would result an impact to GDP of 10-20% and lost output totalling \$15-30bn in year one and \$25-40bn over four years¹.

Most Likely Event:

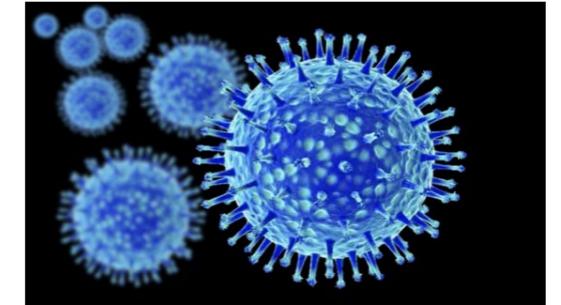
- Seasonal influenza outbreaks during the winter months with increased demand for health services managed at a local level.
- Small numbers of cases of suspect emerging infectious diseases such as MERS-CoV investigated in New Zealand with any confirmed cases linked to international travel.
- 6-7 measles importations each year that leads to a small number of subsequent cases. Each importation will require public health follow up for cases and contacts.

Based on recent history it is almost certain that this scale of event will continue to occur every year.

Note: It is not considered credible that an Emerging Infectious Disease such as Ebola Virus Disease would result in more than a small number of domestic cases occurring as a result of an imported case. Whilst a respiratory disease such as SARS or MERS-CoV could have a larger impact and result in several hundred cases with a very high case fatality rate (c.50%) and a high level of clinical care required which would exceed New Zealand's Intensive Care Unit capacity. Whilst these events would generate significant challenges the overall morbidity and mortality resulting from them would still be significantly less than pandemic influenza.

Risk Management

Communicable Disease



Communicable diseases are diseases that spread from one person to another or from an animal to a person.

The management of **communicable disease including vaccine preventable and emerging infectious diseases** - including novel influenza – may be complex. For some of these threats the population will be immunologically naïve and there may be significant uncertainty on the attack and case fatality rate, as well as what clinical and public health interventions will be effective during the first few months.

A novel influenza virus that is easily transmissible in humans has the potential to cause a **global pandemic**. The impact and severity will be heavily influenced by the case fatality rate of the particular influenza strain.

Current Risk Management

Reduction: The legislation supporting communicable disease preparedness in New Zealand is the Health Act 1956, the Epidemic Preparedness Act 2006 and the Civil Defence and Emergency Management Act 2002.

New Zealand has a comprehensive surveillance system in place to allow for the early detection of emerging infectious diseases as well as existing notifiable diseases.

Many vaccine preventable diseases, but not all, are included on the National Immunisation Schedule.

Addressing social determinants would reduce risk for many communicable diseases but for vaccine preventable diseases

¹ <http://www.treasury.govt.nz/economy/reports/pandemic/tr05-2024.pdf>

The New Zealand SPM pandemic planning model estimates that during the first pandemic wave 1.6 million people in New Zealand would become ill over an 8 week period, with 33,000 deaths. Over subsequent waves the remaining population, until immunised, will likely become infected at some point.

A measles outbreak of nearly 10,000 confirmed cases and 30,000 suspected cases in 1991 in New Zealand led to 7 deaths and several hundred hospitalisations. Modelling identified potential for another outbreak in 1997/98 due to under vaccination (less than 60% fully vaccinated by 2 years old). A mass vaccination campaign was brought forward and limited the outbreak to just over 2000 cases.

The extent of other communicable diseases will depend on the nature of the virus. Recent measles outbreaks although low in total number of cases have caused significant disruption through public health interventions, such as school closures, in order to control the outbreak.

Duration: In the event of pandemic influenza, there is likely to be an initial wave of illness lasting around 8 weeks. This is likely to be followed by further pandemic waves. All four influenza pandemics from the past 120 years have demonstrated multiple waves of infection. The interval between successive waves has ranged from as little as a few months to as long as two to three years.

Outbreaks of vaccine preventable diseases such as Measles, are influenced by a range of factors such as vaccine uptake and completion of the vaccination schedule where more than one dose is required. Global issues, such as the falsified link between Autism and Measles Mumps Rubella (MMR) vaccine in 1998 (Wakefield Study) led to reduced vaccination rates and a vulnerable population in New Zealand of young adults. Until immunisation rates are increased to 91-94% in adults and 95% for secondary school cohort there will be a continuing risk of measles outbreaks.

Frequency

Disease outbreaks are naturally occurring events however it is possible to identify under-immunised populations and identify risk factors that increase the likelihood of an outbreak. Events that concentrate under-immunised populations, such as university induction weeks or festivals, may lead to outbreaks of diseases such as measles. Diseases such as norovirus, that result in acute illness and generate significant volume of persistent virus in vomit and diarrhoea will spread quickly through an institutional setting, such as a cruise ship, hospital or prison unless scrupulous infection prevention control principles are applied.

Influenza pandemics occur when an influenza virus present in animals, either pigs or birds, mutates and becomes easily transmissible in humans. This is a random process, although certain risk factors - such as close habitation between humans and zoonotic hosts - are thought to increase the likelihood of it happening. It is therefore not possible to predict when another influenza pandemic will occur. Currently WHO monitors influenza virus within pigs and birds that have the potential, as H1N1 did in 2009, to become easily transmissible in humans.

During the 20th and 21st centuries to date, there have been four influenza A pandemics, all of which spread around the world within a year of being clinically recognised. These were: the 1918/19 pandemic influenza A (H1N1), the 1957/58 pandemic influenza A (H2N2), the 1968/69 pandemic influenza A (H3N2) and the 2009/10 pandemic influenza A (H1N1) 2009.

Vulnerability/Exposure

The impact of a pandemic on different population groups will vary. For example, Maori and Pacific people, pregnant women and morbidly obese people were more susceptible and harder hit than other groups in the influenza A (H1N1) 2009 pandemic. People who live or work closely to one another (e.g. rest homes, barracks, schools, etc.) are at a higher risk of infection due to this proximity.

Key Assets at Risk

Social: Public health with up to 33,000 deaths and 1.6 million people becoming ill over an 8 week period during the initial pandemic wave alone.

There would be short term effects on employment due both to illness and effects on business and consumer confidence. A severe pandemic will result in high levels of absence in the workforce either through illness or caring for sick relatives and friends. At the peak about a third of the New Zealand population could be ill, convalescing or just recovered.

A severe pandemic would overwhelm social resources due to the exceptional number of people affected. There could be significant school, business and service closures and delays resulting in issues such as shortages of Fast Moving Consumer Goods (FMCG), failure of critical infrastructure and reduction and re-prioritisation of central and local government services. New Zealand assets overseas would be similarly impacted whilst New Zealand's business and government services reliance on a global just-in-time supply chain that would also be impacted would see many unanticipated shortages and system failures precipitate.

Governance/Sovereignty: Short term (months) impact on Government agencies ability to make decisions and provide the normal level of services agreed within agency statement of intents due to prolonged absences from work for (central/ local) government staff. "Front line" services such as law enforcement, fire and emergency services and urgent medical care and may reconfigure their service to only meet "life risk" calls. Agencies would need to identify and maintain their business critical functions.

Economic/Financial: A severe pandemic would have serious adverse short term effects on the economy and on most individual businesses. Studies also highlight that the inherent uncertainty around how serious a pandemic may turn out to be, how long it may last and when things might return to normal will also have a major impact on business and consumer confidence. The global pandemic impact on supply chain may result in disruption to critical raw materials or outsourced production as well as reduced shipping capacity which will all impact the export sector.

Built: No impacts on the built domain expected.

Environmental/Natural: A zoonotic influenza pandemic may concurrently infect native and agricultural species resulting in an increase in morbidity and mortality. Even where species are not symptomatic they may need to be slaughtered as a control mechanism to remove a zoonotic reservoir of the disease. These effects would be experienced globally and the overall impact on New Zealand from the impact on other countries is uncertain. For this assessment estimated as negligible.

appropriate immunisation cover is the most effective reduction method.

WHO Member States in the Western Pacific Region have agreed to work towards measles elimination, i.e. the interruption of endemic (domestic) measles virus transmission. The Western Pacific Region is the second WHO region expected to achieve this goal (after the Americas achieved it in 2002). In 2014 and 2015, Australia, Macao SAR (China), Mongolia, the Republic of Korea, Brunei Darussalam, Cambodia and Japan were verified as having achieved of measles elimination.

Readiness: There is information for the public and health professionals available on the health.govt.nz website. These are articulated in the generic framework described in the National Health Emergency Plan as well as the Communicable Disease handbook, draft NHEP Infectious Diseases Plan and the New Zealand Influenza Pandemic Action Plan. New Zealand has also endorsed the bi-regional Asia Pacific Strategy for Emerging Infectious Diseases (APSED) which supports member states in implementing the International Health Regulations.

A national pandemic reserve stockpile including respiratory protection, antivirals, H5N1 pre-pandemic vaccine and an Advanced Purchase Agreement for pandemic specific vaccine is maintained by Ministry of Health. District Health Boards are funded to hold and maintain locally held national reserves of broad spectrum antibiotics, PPE and critical clinical consumables.

Response: There are a range of possible interventions at different stages of a pandemic. Initially, steps would be taken in the keep it out and stamp it out phases, to allow more time to learn about the virus, how to manage it and to reinforce public health messaging.

Response measures could include border management measures, intensified surveillance, isolation of cases and contacts, changes to healthcare delivery models, promotion of public health messages and the public health interventions.

Recovery: The recovery phase will involve central and local government, organisations, community agencies and individuals.

Lead Agency: Ministry of Health however many of the consequences such as supply chain disruption and reduction in national and local government services would need to be managed through CDEM structures. The duration of a pandemic, up to two to three years mean that other NSS events are likely to occur concurrently.

Future Treatment Options

Surveillance needs to be maintained and plans need to be frequently reviewed and exercised to ensure readiness for a pandemic. Composition of national reserve supplies periodically reviewed. Development of other potential pre-pandemic flu strain vaccines (i.e. H7N9).

Uncertainty/Confidence

There is significant uncertainty in the severity of a novel influenza pandemic. The attack rate, case fatality rate and any vulnerable groups would not be known until sufficient epidemiological data from actual cases had been analysed.

Confidence rating: B - There is reasonable confidence in the range of assets affected however the interconnectedness of societies across the globe has not been tested in this way for over 50 years. Business continuity impacts across all sectors may be greater than anticipated.

System Trends

Anti-microbial resistance (AMR) may decrease the effectiveness of broad spectrum antibiotics and the **prevalence of chronic diseases** could increase mortality rates.

Housing crises that increase people per dwellings could increase transmission rates.

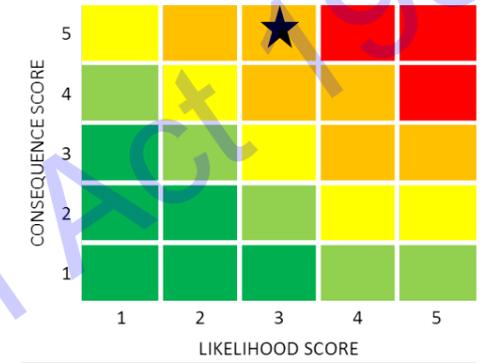
Rising geographic mobility will potentially increase transmission paths for new disease strain into New Zealand.

Consequence Ranking (MCE)

Consequence Score: 5

Domains	Insignificant	Minor	Moderate	Major	Extreme
Social					✓
Governance				✓	
Economic				✓	
Built	✓				
Environment	✓				

Risk Heat Map (w/Current Treatment Measures)



Risk Scenarios Assessment

Scenario/Event Name	Likelihood	Consequence	Confidence
MCE Influenza Pandemic (SP)	③	⑤	A
Influenza Pandemic, mild (IP)	③	③	A
Measles (M)	⑤	③	A
Seasonal ILI (SI)	⑤	②	A
Imported non-respiratory (IN)	①	④	E
Emerging respiratory (ER)	③	④	B
Waterborne gastroenteritis (G)	③	②	A
Pertussis (P)	⑤	②	A
Multi-drug resistant disease (MR)	⑤	②	A

Released under the Official Information Act 2002

Additional Risk Scenarios*

Influenza Pandemic that is milder than the NZ Standard Pandemic Model (MP)

- High social impacts on health care sector in particular
- Casualties 100s of people
- Limited impact on governance, economy, built or natural environments

Measles (M)

- 1000s-10,000s infected; fatalities likely in less than 10 cases
- Significant impact on public health services, including increased push for vaccination
- Expect significant, heated public debate regarding vaccination and exclusion from public places of non-vaccinated children and adults

Seasonal Influenza Like Illness (SI)

- Yearly occurrences of northern hemisphere influenza-like viruses
- Demand on public health services main impact
- Isolated fatalities (less than 100) nationwide, (particularly vulnerable elderly but difficult to attribute directly to ILI due to coincident conditions)

Imported case of High Consequence Low Likelihood disease (non-respiratory) (IN)

- E.g. Ebola or similar illness reaching NZ
- NZ's isolation and lack of population movement with likely source locations provides good lead-in planning time
- Very low probability but high public concern/outrage factor and potentially high fatalities if not isolated

Emerging severe respiratory infectious disease (ER)

- Low likelihood high consequence (e.g. SARS)
- Potentially high fatality and high public concern/outrage if NZ were to experience such an event

Outbreak of waterborne gastroenteritis (G)

- High demand on local/regional health services
- Isolated fatalities possible
- Disruption to social activities, schooling, restaurant/catering locally
- Welfare support (potable water deliveries) to homes and communities required

Pertussis (whooping cough) (P)

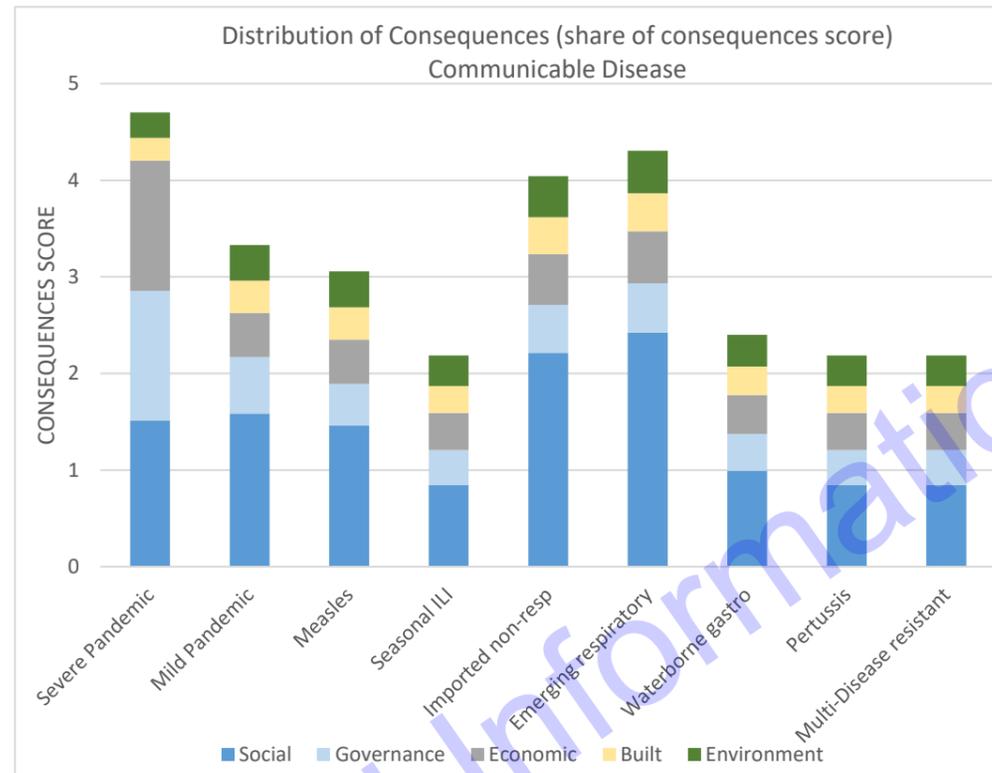
- Outbreaks occur every 30years. Last outbreak 11,000 cases notified
- Isolated fatalities (young children most vulnerable)

Outbreak of disease that is multi-drug resistant (MR)

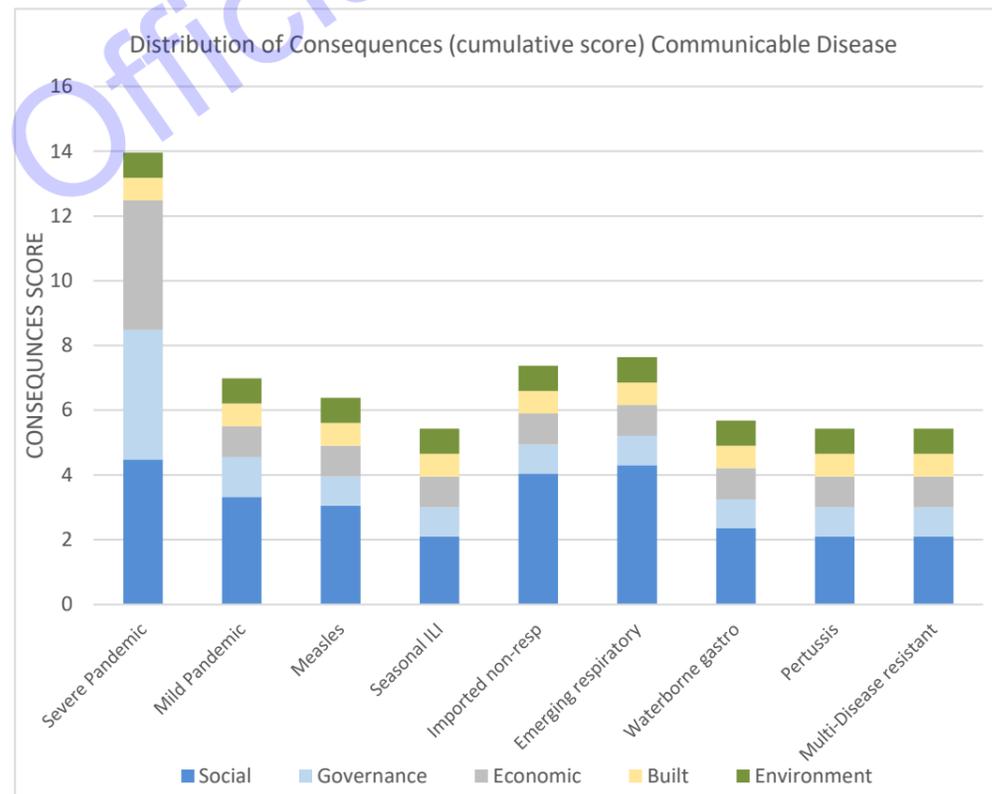
- Single cases now regular occurrences in NZ hospitals
- Expected to increase in number and severity in the future
- Isolated fatalities and moderate public concern (safety of hospitals)

*Note: documentation and references are available for all additional scenarios in the NRR archives.

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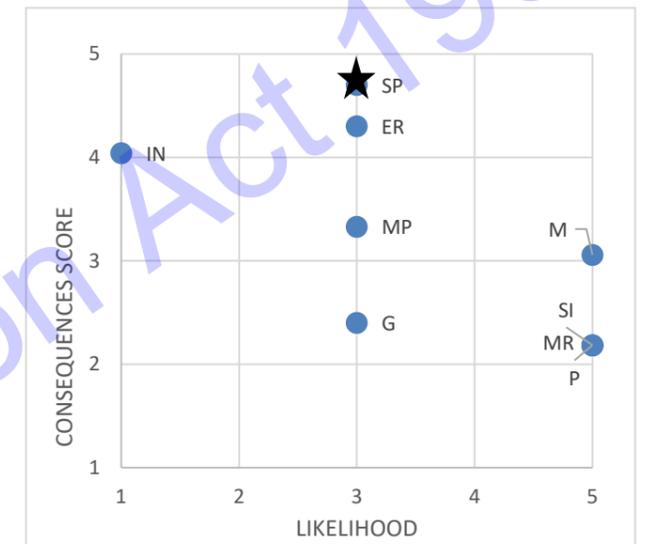
The above plot shows the proportion contributed by each domain to the total consequence score. Only Severe Pandemic has significant impacts on governance and economic assets.



Cumulative score showing clear difference between Severe Pandemic and other risk scenarios. While social impacts may be equivalent for several scenarios, the other domains are not as affected.

RESTRICTED

Distribution of Risk Scenarios Graph



Key to letter codes: Refer to Additional Risk Scenarios description and assessment scores table. The Maximum Credible Event scenario (Severe Pandemic) is indicated by a star and (SP).

The scenarios include a range of historic (actual) events, well-modelled and understood scenarios. Confidence is highest for actual events, high for modelled events.

All scenarios have greatest impacts on social assets, particularly: public health (fatalities and hospitalisation), provision of health services and public concern/outrage.

RISK MANAGEMENT – COMMUNICABLE DISEASE (HUMAN)

Reduction and Readiness

New Zealand has some advantages when planning for a pandemic given our modern health system, comparatively easily managed borders, simple and effective government structure and a generally strong sense of community.

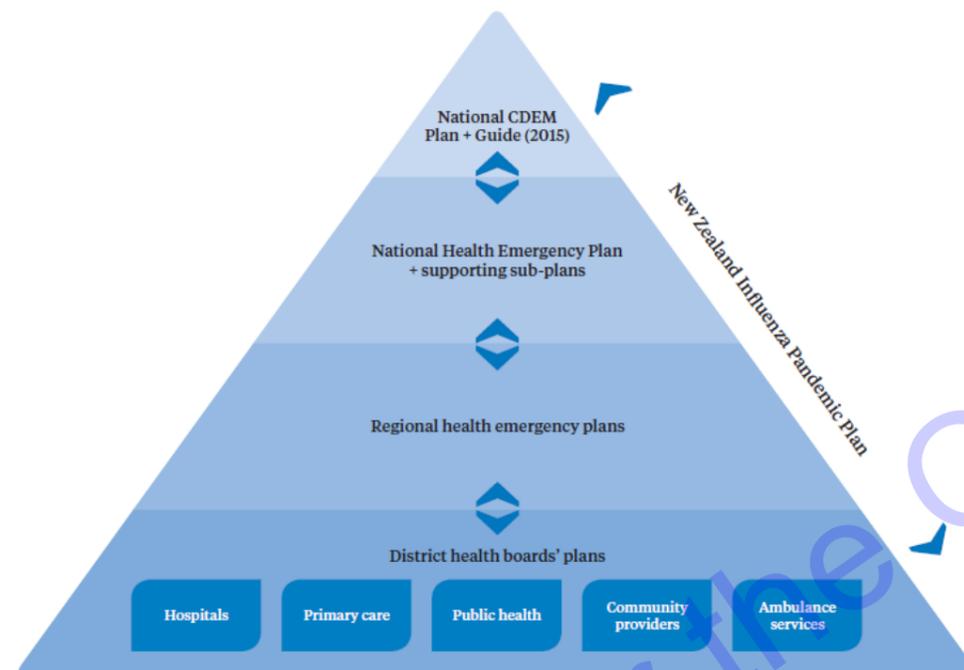
Key Agencies: Ministry of Health, District Health Boards, Border Agencies

The legislation supporting pandemic preparedness in New Zealand is the Health Act 1956, the Epidemic Preparedness Act 2006 and the Civil Defence and Emergency Management Act 2002.

National plans: These are frequently updated and exercised. The national plans in place are:

The National Health Emergency Plan 2015 (<http://www.health.govt.nz/system/files/documents/publications/national-health-emergency-plan-oct15-v2.pdf>) provides the overarching direction to the health and disability sector and all of government. It provides a framework for the Health and Disability sector which describes their roles and responsibilities across all four phases of the Disaster Risk management cycle (the four R's).

This is supported by a range of technical and operational plans across the sector.



The New Zealand Influenza Pandemic Plan 2017 (<http://www.health.govt.nz/system/files/documents/publications/influenza-pandemic-plan-framework-action-2nd-edn-aug17.pdf>) sets out the all of government measures to prepare and respond to an influenza pandemic. This document is an update on the New Zealand Influenza Pandemic Plan 2010 – itself, based on lessons identified in the 2009 pandemic. These lessons allow the plan to be adapted to support a milder pandemic.

The plan is primarily a central government planning and response framework, and is intended to inform, but not prescribe the structure of local plans. The key objective of the plan is to minimise deaths, serious illness and serious disruption to communities and the economy arising from an influenza pandemic. The plan is arranged in three sections: a framework for action, a detailed action plan of agencies roles and responsibilities across the pandemic phases and explanatory material.

New Zealand also supports a range of regional and global frameworks for pandemics and emerging infectious disease such as the Asia Pacific Strategy for Emerging Diseases (http://www.wpro.who.int/emerging_diseases/APSED2010/en/). These are aligned with the International Health Regulations (2005) which require member states to maintain core capacities to identify and manage Public Health Emergencies of International Concern.

Response and Recovery

The Ministry of Health funds and maintains incident and event based surveillance systems (<https://surv.esr.cri.nz/>) to enable the early detection of novel influenza viruses and other emerging infectious diseases. These are coordinated with Ministry of Primary Industry to ensure coverage of zoonotic diseases as well. These systems would be used to monitor the progress of a pandemic in New Zealand and supplemented by enhanced surveillance as well as additional reporting and social media monitoring. Information from surveillance would play a key role in guiding actions throughout all phases of a pandemic.

New Zealand also contributes to regional and global monitoring, including maintaining the following WHO programmes:

- Influenza at Human-Animal Interface: http://www.who.int/influenza/human_animal_interface/en/
- WHO Influenza monitoring http://www.who.int/influenza/surveillance_monitoring/updates/latest_update_GIP_surveillance/en/

Key factors that will inform the actions to be taken in a pandemic response include the ease of transmission and severity, the availability of a vaccine and efficacy of treatment on morbidity and mortality.

The New Zealand Influenza Pandemic Action Plan contains extensive information for each phase of the response, including actions that may need to be taken and the agencies and organisations that may have a role. The response is based on 6 phases:

1. Plan for it (planning and preparedness)
2. Keep it out (border management),
3. Stamp it out (cluster control)
4. Manage it (pandemic management)
5. Manage it (post peak)
6. Recover from it (recovery).

The plan highlights a range of Key Decisions and the level of decision making that would be required for them. These include public health interventions such as school or business closures designed to reduce transmission as well as the mobilisation of the national reserve pandemic supplies. These include anti-virals and respiratory protection, as well as 150,000 courses of pre-pandemic vaccine for key workforce in the event of an H5N1 influenza pandemic. The most significant element is an Advanced Purchase Agreement that provides New Zealand with access to a pandemic specific vaccine once this becomes available. A decision on whether to activate this and the quantity to order would need to be made within a few days of WHO declaring a pandemic. This decision would need to be made at a time when incomplete information on the severity or impact of the disease is known. In the 2009 H1N1 influenza pandemic officials recommended not to activate the agreement whilst some other governments ordered the monovalent pandemic vaccine and had significant underutilised stock as the pandemic proved less severe than feared and manufacturers resumed normal trivalent seasonal flu vaccine production.

The Ministry of Health, following consultation with other agencies, is responsible for advising government on recovery activities and any special arrangements that may be necessary according to the severity of the pandemic and the likelihood of additional waves.

RISK PROFILE – COMMUNICABLE DISEASE (HUMAN)

Rating: Very High

Shock/Stress Description

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DRAFT NRR: RESTRICTED

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Likelihood Score: 3

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A worst case scenario would involve *higher case fatality rates*, including the likelihood that *some population groups would be affected more severely than other*.

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Most Likely Event:

- Seasonal influenza outbreaks during the winter months with increased demand for health services managed at a local level.
- Small numbers of cases of suspect emerging infectious diseases such as MERs-CoV investigated in New Zealand with any confirmed cases linked to international travel.
- 6-7 measles importations each year that leads to a small number of subsequent cases. Each importation will require public health follow up for cases and contacts.

Based on recent history it is almost certain that this scale of event will continue to occur every year.

Note: It is not considered credible that an Emerging Infectious Disease such as Ebola Virus Disease would result in more than a small number of domestic cases occurring as a result of an imported case. Whilst a respiratory disease such as SARS or MERS-CoV could have a larger impact and result in several hundred cases with a very high case fatality rate (c.50%) and a high level of clinical care required which would exceed New Zealand's Intensive Care Unit capacity. Whilst these events would generate significant challenges the overall morbidity and mortality resulting from them would still be significantly less than pandemic influenza.

Key Assets at Risk

Social: A severe pandemic is a significant risk to public health with up to 33,000 deaths and 1.6 million people becoming ill over an 8 week period during the initial pandemic wave alone.

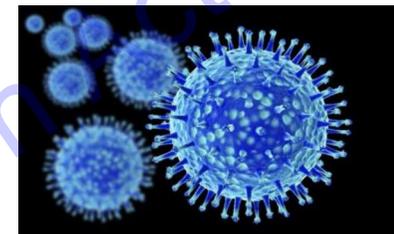
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Reduction: The legislation supporting communicable disease preparedness in New Zealand is the Health Act 1956, the Epidemic Preparedness Act 2006 and the Civil Defence and Emergency Management Act 2002.

New Zealand has a comprehensive surveillance system in place to allow for the early detection of emerging infectious diseases as well as existing notifiable diseases.

Many vaccine preventable diseases, but not all, are included on the National Immunisation Schedule.

Addressing social determinants would reduce risk for many communicable diseases but for vaccine preventable diseases appropriate immunisation cover is the most effective reduction method.

WHO Member States in the Western Pacific Region have agreed to work towards measles elimination, i.e. the interruption of endemic (domestic) measles virus transmission. The Western Pacific Region is the second WHO region expected to achieve this goal (after the Americas achieved it in 2002). In 2014 and 2015, Australia, Macao SAR (China), Mongolia, the Republic of Korea, Brunei Darussalam, Cambodia and Japan were verified as having achieved of measles elimination.

Readiness: There is information for the public and health NOT GOVERNMENT POLICY
Revision Date: 30 May 2016

Duration: In the event of pandemic influenza, there is likely to be an initial wave of illness lasting around 8 weeks. This is likely to be followed by further pandemic waves. All four influenza pandemics from the past 120 years have demonstrated multiple waves of infection. The interval between successive waves has ranged from as little as a few months to as long as two to three years.

Outbreaks of vaccine preventable diseases such as Measles, are influenced by a range of factors such as vaccine uptake and completion of the vaccination schedule where more than one dose is required. Global issues, such as the falsified link between Autism and Measles Mumps Rubella (MMR) vaccine in 1998 (Wakefield Study) led to reduced vaccination rates and a vulnerable population in New Zealand of young adults. Until immunisation rates are increased to 91-94% in adults and 95% for secondary school cohort there will be a continuing risk of measles outbreaks.

Frequency

Disease outbreaks are naturally occurring events however it is possible to identify under-immunised populations and identify risk factors that increase the likelihood of an outbreak. Events that concentrate under-immunised populations, such as university induction weeks or festivals, may lead to outbreaks of diseases such as measles. Diseases such as norovirus, that result in acute illness and generate significant volume of persistent virus in vomit and diarrhoea will spread quickly through an institutional setting, such as a cruise ship, hospital or prison unless scrupulous infection prevention control principles are applied.

Influenza pandemics occur when an influenza virus present in animals, either pigs or birds, mutates and becomes easily transmissible in humans. This is a random process, although certain risk factors - such as close habitation between humans and zoonotic hosts - are thought to increase the likelihood of it happening. It is therefore not possible to predict when another influenza pandemic will occur. Currently WHO monitors influenza virus within pigs and birds that have the potential, as H1N1 did in 2009, to become easily transmissible in humans.

During the 20th and 21st centuries to date, there have been four influenza A pandemics, all of which spread around the world within a year of being clinically recognised. These were: the 1918/19 pandemic influenza A (H1N1), the 1957/58 pandemic influenza A (H2N2), the 1968/69 pandemic influenza A (H3N2) and the 2009/10 pandemic influenza A (H1N1) 2009.

Vulnerability/Exposure

The impact of a pandemic on different population groups will vary. For example, Maori and Pacific people, pregnant women and morbidly obese people were more susceptible and harder hit than other groups in the influenza A (H1N1) 2009 pandemic. People who live or work closely to one another (e.g. rest homes, barracks, schools, etc.) are at a higher risk of infection due to this proximity.

Uncertainty/Confidence

There is significant uncertainty in the severity of a novel influenza pandemic. The attack rate, case fatality rate and any vulnerable groups would not be known until sufficient epidemiological data from actual cases had been analysed

Confidence rating: B - There is reasonable confidence in the range of assets affected however the interconnectedness of societies across the globe has not been tested in this way for over 50 years. Business continuity impacts across all sectors may be greater than anticipated.

System Trends

Anti-microbial resistance (AMR) may decrease the effectiveness of broad spectrum antibiotics and the prevalence of chronic diseases could increase mortality rates.

Housing crises that increase people per dwellings could increase transmission rates.

Rising geographic mobility will potentially increase transmission paths for new disease strain into New Zealand.

reconfigure their service to only meet “life risk” calls. Agencies would need to identify and maintain their business critical functions.

Economic/Financial: A severe pandemic would have serious adverse short term effects on the economy and on most individual businesses. Treasury modelling in 2006 suggested an impact of \$5-6bn in the first year and economic disruption of 1-2% of GDP in a mild pandemic (such as in 1957 or 1968) whilst a severe pandemic (as per 1918) would result an impact to GDP of 10-20% and lost output totalling \$15-30bn in year one and \$25-40bn over four years.

Studies also highlight that the inherent uncertainty around how serious a pandemic may turn out to be, how long it may last and when things might return to normal will also have a major impact on business and consumer confidence.

The global pandemic impact on supply chain may result in disruption to critical raw materials or outsourced production as well as reduced shipping capacity which will all impact the export sector.

<http://www.treasury.govt.nz/economy/reports/pandemic/tr05-2024.pdf>

Built: No impacts on the built domain expected.

Environmental/Natural: A zoonotic influenza pandemic may concurrently infect native and agricultural species resulting in an increase in morbidity and mortality. Even where species are not symptomatic they may need to be slaughtered as a control mechanism to remove a zoonotic reservoir of the disease. These effects would be experienced globally and the overall impact on New Zealand from the impact on other countries is uncertain. For this assessment estimated as negligible.

Consequence Ranking Consequence Score: 4

Domains	Insignificant	Minor	Moderate	Major	Extreme
Social				✓	
Governance		✓			
Economic				✓	
Built	✓				
Environment	✓				

professionals available on the health.govt.nz website. These are articulated in the generic framework described in the National Health Emergency Plan as well as the Communicable Disease handbook, draft NHEP Infectious Diseases Plan and the New Zealand Influenza Pandemic Action Plan. New Zealand has also endorsed the bi-regional Asia Pacific Strategy for Emerging Infectious Diseases (APSED) which supports member states in implementing the International Health Regulations.

A national pandemic reserve stockpile including respiratory protection, antivirals, H5N1 pre-pandemic vaccine and an Advanced Purchase Agreement for pandemic specific vaccine is maintained by Ministry of Health. District Health Boards are funded to hold and maintain locally held national reserves of broad spectrum antibiotics, PPE and critical clinical consumables.

Response: There are a range of possible interventions at different stages of a pandemic. Initially, steps would be taken in the keep it out and stamp it out phases, to allow more time to learn about the virus, how to manage it and to reinforce public health messaging.

Response measures could include border management measures, intensified surveillance, isolation of cases and contacts, changes to healthcare delivery models, promotion of public health messages and the public health interventions.

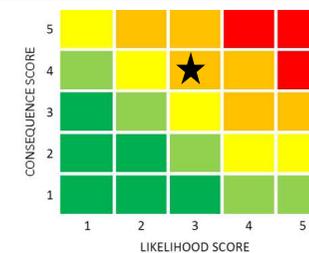
Recovery: The recovery phase will involve central and local government, organisations, community agencies and individuals.

Lead Agency: Ministry of Health however many of the consequences such as supply chain disruption and reduction in national and local government services would need to be managed through CDEM structures. The duration of a pandemic, up to two to three years mean that other NSS events are likely to occur concurrently

Future Treatment Options

Surveillance needs to be maintained and plans need to be frequently reviewed and exercised to ensure readiness for a pandemic. Composition of national reserve supplies periodically reviewed. Development of other potential pre-pandemic flu strain vaccines (i.e. H7N9).

Risk Heat Map (w/Current Treatment Measures)



RISK MANAGEMENT – COMMUNICABLE DISEASE (HUMAN)

Reduction and Readiness

New Zealand has some advantages when planning for a pandemic given our modern health system, comparatively easily managed borders, simple and effective government structure and a generally strong sense of community.

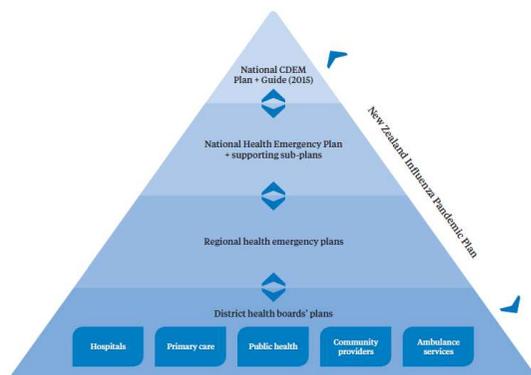
Key Agencies: Ministry of Health, District Health Boards, Border Agencies

The legislation supporting pandemic preparedness in New Zealand is the Health Act 1956, the Epidemic Preparedness Act 2006 and the Civil Defence and Emergency Management Act 2002.

National plans: These are frequently updated and exercised. The national plans in place are:

The National Health Emergency Plan 2015 (<http://www.health.govt.nz/system/files/documents/publications/national-health-emergency-plan-oct15-v2.pdf>) provides the overarching direction to the health and disability sector and all of government. It provides a framework for the Health and Disability sector which describes their roles and responsibilities across all four phases of the Disaster Risk management cycle (the four R's).

This is supported by a range of technical and operational plans across the sector.



The New Zealand Influenza Pandemic Plan 2011 (<https://www.health.govt.nz/system/files/documents/publications/nzipap-framework-for-action-apr2010.pdf>) provides an overarching framework for possible actions during a pandemic and is an all of government cross sectoral plan and was reviewed following lessons identified in the 2009 pandemic. These lessons allowed for the plan to be adapted to support a milder pandemic.

The plan is primarily a central government planning and response framework, and is intended to inform, but not prescribe the structure of local plans. The key objective of the plan is to minimise deaths, serious illness and serious disruption to communities and the economy arising from an influenza pandemic. The plan is arranged in three sections: a framework for action, a detailed action plan of agencies roles and responsibilities across the pandemic phases and explanatory material.

New Zealand also supports a range of regional and global frameworks for pandemics and emerging infectious disease such as the Asia Pacific Strategy for Emerging Diseases (http://www.wpro.who.int/emerging_diseases/APSED2010/en/). These are aligned with the International Health Regulations (2005) which require member states to maintain core capacities to identify and manage Public Health Emergencies of International Concern.

Response and Recovery

The Ministry of Health funds and maintains incident and event based surveillance systems (<https://surv.esr.cri.nz/>) to enable the early detection of novel influenza viruses and other emerging infectious diseases. These are coordinated with Ministry of Primary Industry to ensure coverage of zoonotic diseases as well. These systems would be used to monitor the progress of a pandemic in New Zealand and supplemented by enhanced surveillance as well as additional reporting and social media monitoring. Information from surveillance would play a key role in guiding actions throughout all phases of a pandemic.

New Zealand also contributes to regional and global monitoring, including maintaining the following WHO programmes:

- Influenza at Human-Animal Interface: http://www.who.int/influenza/human_animal_interface/en/
- WHO Influenza monitoring http://www.who.int/influenza/surveillance_monitoring/updates/latest_update_GIP_surveillance/en/

Key factors that will inform the actions to be taken in a pandemic response include the ease of transmission and severity, the availability of a vaccine and efficacy of treatment on morbidity and mortality.

The New Zealand Influenza Pandemic Action Plan contains extensive information for each phase of the response, including actions that may need to be taken and the agencies and organisations that may have a role. The response is based on 6 phases:

1. Plan for it (planning and preparedness)
2. Keep it out (border management),
3. Stamp it out (cluster control)
4. Manage it (pandemic management)
5. Manage it (post peak)
6. Recover from it (recovery).

The plan highlights a range of Key Decisions and the level of decision making that would be required for them. These include public health interventions such as school or business closures designed to reduce transmission as well as the mobilisation of the national reserve pandemic supplies. These include anti-virals and respiratory protection, as well as 150,000 courses of pre-pandemic vaccine for key workforce in the event of an H5N1 influenza pandemic. The most significant element is an Advanced Purchase Agreement that provides New Zealand with access to a pandemic specific vaccine once this becomes available. A decision on whether to activate this and the quantity to order would need to be made within a few days of WHO declaring a pandemic. This decision would need to be made at a time when incomplete information on the severity or impact of the disease is known. In the 2009 H1N1 influenza pandemic officials recommended not to activate the agreement whilst some other governments ordered the monovalent pandemic vaccine and had significant underutilised stock as the pandemic proved less severe than feared and manufacturers resumed normal trivalent seasonal flu vaccine production.

The Ministry of Health, following consultation with other agencies, is responsible for advising government on recovery activities and any special arrangements that may be necessary according to the severity of the pandemic and the likelihood of additional waves.