

PREPARING FOR A HUMAN INFLUENZA
PANDEMIC IN SINGAPORE

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Be Prepared for an Influenza Pandemic

On 21 Oct 2007, an outbreak of the highly lethal H5N1 virus was confirmed at a poultry farm in North-West Frontier Province, Pakistan. A group of workers were immediately called to cull all the chickens on the farm. One of them handled the chickens without using any personal protective equipment and he developed fever and other symptoms a week later. Instead of resting at home, he travelled to his family home in another district where he passed the virus to his brother, who in turn infected two other brothers. A fourth brother was also infected but did not show any symptoms. The culler and two of his brothers eventually recovered, but the other two brothers died a month later. Among the people who attended the funerals was a brother who was from New York. Upon his return to the United States, he was tested by health authorities who were worried that he could have brought the virus into the country. Fortunately, he tested negative.

This episode of a limited outbreak of human-to-human transmission of H5N1 shows how compact our world has become and how quickly and widely an infectious disease could spread. Indeed, in today's highly interconnected world, the spread of infectious diseases

has emerged as a significant challenge to global security. If a pandemic occurs, millions of people could fall ill or die. The fallout could ripple across countries over a prolonged period of time. For this reason, the health community is concerned with the outbreaks of H5N1 among poultry and its sporadic infections of humans in recent years. If the virus mutates further, it could eventually result in a pandemic strain.

Another lesson from the outbreak in Pakistan was that it took time for the public to learn about the cases. Although the infections and subsequent deaths took place between October and November 2007, the first media reports surfaced only in early December 2007. Information was sketchy and sometimes conflicting. It was only in mid-December that the world had a clearer picture of what was happening in Pakistan. We can expect the same uncertainty during the initial stage of a pandemic. Therefore, we must be prepared to take early tough measures at the onset before the entry of the virus into Singapore, and our plans must be flexible so that they can be adapted as more information becomes available.

The outbreak of the Severe Acute Respiratory Syndrome (SARS) in Singapore in 2003 has taught us a valuable lesson on how a medical crisis could develop quickly into a national crisis affecting more than the health sector. The SARS outbreak, however, does not give a complete picture of what we could face in a highly infectious influenza pandemic. While we are unable to predict how severe such a pandemic will be, we can certainly plan for it now and develop tough measures to minimise the impact and to speed up our recovery.

This publication outlines Singapore's approach to dealing with the threat of pandemic influenza: how we are preparing for it and how we will respond during a pandemic. It is targeted at crisis planners and those who are keen to develop a deeper understanding of the pandemic threat and to devise ways to better prepare for it. It describes the roles played by the Government, the private sector and the community. While the Government will do its utmost to mitigate the impact, it needs the cooperation of the private sector and the community for the success of any measure. The private sector must help to keep the economy going and to sustain the population during a severe pandemic.

Individuals must take personal responsibility for their health and work with the Government to observe advisories to contain the spread of the disease. This collective Singapore approach is the only way we can reduce the impact of a pandemic.

No one knows when the next influenza pandemic will take place. We must make sure that when it eventually happens, we are prepared.



WONG KAN SENG

Minister for Home Affairs
Chairman, Homefront Crisis
Ministerial Committee (Avian Flu)

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Introduction

In the past century, the world has witnessed three influenza pandemics, one of which killed at least 50 million people worldwide in 1918-1919. An influenza pandemic occurs when several epidemic outbreaks of a new influenza virus emerge at the same time. People have limited or no immunity to this new virus and there is currently no vaccine. In today's context, an influenza pandemic can emerge when an avian influenza virus undergoes genetic changes that allow it to spread rapidly among humans for a sustained period of time.

In recent years, countries have seen the emergence of new strains of avian influenza that have killed untold number of poultry and wild birds. Since 2003, avian influenza has also killed more than 240 humans¹, mostly through prolonged close contact with infected birds. This is more than 60 per cent of

the total number of people known to be infected. The lethality of avian influenza to humans, combined with its rapid and wide geographical spread among birds, makes it particularly alarming. Singapore recognises the emergence of these new strains of avian influenza as a grave threat to public health and national security. While the highly lethal strains are not yet capable of spreading rapidly among humans, the Government is treating this possibility seriously. It is taking steps to better prepare the entire population to deal with an influenza pandemic if and when it occurs. Good preparation is the key to responding well to a pandemic. For this reason, this document is targeted primarily at crisis planners and individuals who are keen to develop a deeper understanding of the pandemic threat and to devise ways to better prepare for it.

¹ For the latest figures, please check the World Health Organization website at <http://www.who.int/en/>

Pandemic Influenza: Potentially More Devastating than SARS

No one can predict exactly how an influenza pandemic will evolve because there are too many unknowns about the novel virus that will cause the pandemic. The severity of the pandemic depends on the speed and ease of human-to-human transmission of the virus and its lethality. If the virus is lethal and easily transmissible, the impact of the pandemic will be more severe and prolonged than the outbreak of Severe Acute Respiratory Syndrome (SARS) in 2003. It will be a national crisis of a much larger scale, where human resources are removed from all sectors including critical infrastructure and essential services. Not only will mortality and morbidity be higher during a severe pandemic, all aspects of economic and social life are expected to be affected. Unlike the SARS outbreak, our priority during an influenza pandemic is not only to protect lives, but also to safeguard national survivability.

Guiding Principles

Dealing with an influenza pandemic requires coordinated national preparations, a flexible plan to guide decisive response and continued collaboration among entities within and beyond Singapore. Our national strategy is based on the following guiding principles:

i. A ‘Whole of Singapore’ approach: An influenza pandemic is not just a medical crisis affecting

only the national health system. It is a national crisis that will have wide-ranging public health, economic and social impact. We need an integrated national response where public agencies, private organisations and the community work in a coordinated way to deal with both health and non-health issues. All national resources must be deployed to ensure timely intervention to mitigate the impact of a pandemic.

ii. Close collaboration between the Government and the private sector: The public health impact as well as national and international reactions to the pandemic will have an impact on non-government entities such as businesses, schools and privately-run essential services. The Government has been actively engaging these stakeholders in developing pandemic preparedness plans and will continue to work with them to ensure that their plans are consistent with the national strategy.

iii. An informed and prepared public: The public can and must play a vital role in containing outbreaks within Singapore. They should take measures to protect themselves and their families, seek treatment if they fall sick and limit contact with other people. Active public involvement requires a good public information strategy for the various stages of a pandemic. The public must be given timely and accurate information so that they can take the right steps to protect themselves and their families. This will help create public compliance towards Government measures such as social distancing and build social resilience that will keep Singapore going during the crisis.

iv. Rapid and decisive Government actions:

Singapore is particularly vulnerable to pandemic influenza because of our proximity to outbreaks of highly lethal avian influenza in Southeast Asia. Therefore, we need to quickly and efficiently implement control measures after the pandemic virus is detected in other countries. Singapore's fewer border checkpoints compared to that in larger countries means that we can implement early measures at the checkpoints to slow the entry of the virus. Tough actions will have to be taken even in a climate of uncertainty when information about the virus is limited or unavailable. The Government has developed plans and procedures for treating and containing the disease, and maintaining its essential functions. These plans and procedures are regularly tested and refined to ensure that they remain updated and relevant.

v. Collaboration with the international community:

A country on its own cannot deal effectively and comprehensively with an influenza pandemic. Countries and international organisations must work together to detect early the first signs of a pandemic and to contain it quickly or to slow the spread of the virus to other countries. Singapore's approach is to work with neighbouring countries and other international players to develop mutually beneficial mechanisms for coping with a pandemic. This includes improving medical surveillance and reporting so that we have advance warnings of a pandemic.

vi. Flexibility in national response: Given

that we do not know when or how a pandemic virus will evolve or how virulent it will be, our plans must be flexible and adaptable. Specific strategies outlined in this document will be re-examined when there is new information on disease propagation, lethality and treatment options, as well as real-world effectiveness of proposed Government actions.

Purpose and Goals

This National Strategy provides a framework for partnership of preparedness among the Government, the private sector and individuals. This will enable actions to be taken in advance of a serious threat to Singapore's public health and national security. The document will:

- i.** Illustrate how pandemic influenza could impact Singapore;
- ii.** Set goals for nationwide preparedness at different stages of a pandemic – pre-pandemic, pandemic outside Singapore, initial stage of pandemic in Singapore and widespread pandemic in Singapore;
- iii.** Outline planning parameters and assumptions that will guide the national response;
- iv.** Inform the private sector and the public of the types of actions which the Government may take to detect, prevent, contain and recover from a pandemic;

- v.** Inform the private sector and the public of how they should prepare in advance of a pandemic;
- vi.** Identify and balance the significant trade-offs between the paramount goals of protecting public health and national security, and protecting economic and social activities that may be impacted by the mitigation measures.

This document also describes the Government's plans for achieving the goals for each stage of a pandemic:

- i.** Pre-pandemic stage – To strengthen national preparedness by developing plans for health and non-health issues that will surface during a pandemic;
- ii.** Pandemic outside Singapore – To delay the import of pandemic influenza that occurs in other countries;
- iii.** Initial stage of pandemic in Singapore – To take tough measures to slow the spread of the virus once initial cases are identified in the community;
- iv.** Widespread pandemic in Singapore – To mitigate human suffering as well as the impact on social structures and the economy; to sustain the population by maintaining core Government operations and essential services provided by the private sector.

This National Strategy provides the overall elements of the Government's response and preparedness plans. It is, however, not intended to provide specific directions to Government agencies, the private sector and individuals. Additional information can be obtained from other publicly accessible documents. The list of recommended websites on pandemic influenza and pandemic planning is in the Annex.

Understanding the Threat

The pandemic threat is different from the SARS outbreak in 2003. SARS infected 238 people and killed 33 in Singapore between March and May 2003. In comparison, the number of deaths from pandemic influenza is likely to be much higher. Even seasonal influenza infects about 20% of the Singapore population each year, with an annual average of 600 deaths. In addition to the costs in terms of human lives, pandemic influenza also has the potential to significantly cripple Singapore's economic and social activities, including the delivery of essential services such as food, water and energy to the population. When developing their plans, it is important that planners have good understanding of pandemic influenza, including its potential impact on Singapore.

What is Influenza?

Influenza is an acute viral infection of the upper respiratory tract that is common in both human and animal populations. It can infect the nose, throat, bronchi and very rarely, the lungs. Typical symptoms of influenza include fever, headache, fatigue, cough, sore throat, runny nose, body ache, diarrhoea and vomiting. Influenza can also lead to severe complications of underlying diseases, secondary infections such as pneumonia, or even death. Severity of the disease depends on factors such as the strain of the virus, susceptibility of a patient to influenza and treatment effectiveness.

What is Seasonal Influenza?

Seasonal influenza is the normally occurring influenza affecting human populations every year. The strains that currently spread among humans are not highly lethal. However, as they spread efficiently within communities, they infect up to 500 million people worldwide and cause up to 500,000 deaths each year. More than 90% of the deaths are attributed to pneumonia. Majority of the dead are older persons aged 65 years and above.

In temperate countries, seasonal influenza

infections occur predominantly during winter while in tropical countries, they can occur any time. In Singapore, such infections happen throughout the year with two seasonal peaks: usually from March to May and from November to January. The two peaks coincide with the winter seasons in the Southern and Northern hemispheres respectively. It is possible to prevent an infection through antiviral medications or yearly vaccinations. As the precise strains of influenza change from year to year due to slight mutations, vaccine manufacturers have to develop new vaccines every year for specific strains.

What is Avian Influenza?

Avian influenza, commonly known as bird flu, is caused by influenza strains that spread efficiently among bird populations, particularly poultry. At times, avian influenza can infect humans but this is rare and typically occurs through persistent and close contact between humans and infected birds. There are several forms of avian influenza that are currently circulating among bird populations. The low pathogenic form (LPAI) may be undetected and causes only mild symptoms, such as ruffled feathers and reduced egg production. The highly pathogenic form (HPAI) may cause diseases that affect multiple organs and has a mortality rate that reaches almost 100%, often within 48 hours. HPAI has killed tens of millions of birds in Asia, Europe, Middle East and Africa. Fifteen countries have reported human infections and more than 240 people have died since 2003². The virus has yet to demonstrate an ability to

spread efficiently among humans, but it could potentially do so if it undergoes significant mutation.

What is Pandemic Influenza?

Unlike seasonal influenza, pandemic influenza is caused by a new subtype of virus for which there is little or no human immunity. An influenza pandemic is a rare but recurrent event. Three pandemics occurred in the last century: Spanish influenza (1918-1919), Asian influenza (1957-1958) and Hong Kong influenza (1968-1969). A pandemic can occur any time of the year and the pattern of spread, severity and mortality cannot be predicted accurately till the virus emerges. Generally, an influenza pandemic occurs when three conditions are met:

- i. A new viral subtype emerges for which there is no human immunity;
- ii. The virus is capable of infecting humans and causing serious illness;
- iii. The spread of the virus among the human population is efficient and sustained.

According to WHO, the current outbreaks of human cases of H5N1 have met the first two conditions. When the virus is able to transmit efficiently from one person to another person for a sustained period of time, a pandemic is underway. It is important to note that although H5N1 is of the greatest concern and is the focus of current surveillance and research, it is possible that a future pandemic may originate from other strains of influenza circulating among animal populations.

² For the latest figures, please check the World Health Organization website at <http://www.who.int/en/>

Evolution of Pandemic Influenza

A pandemic virus can emerge through two processes. The first is genetic mutation which all influenza viruses undergo. It is a process through which a virus gradually mutates over time and eventually gains the ability to infect humans easily. This process

is hypothesised to have caused the Spanish influenza pandemic. The second process involves the commingling of a seasonal influenza virus and an animal influenza virus that results in a new strain with pandemic potential. This was how the Asian influenza and Hong Kong influenza viruses evolved.

HISTORY OF INFLUENZA PANDEMICS

Spanish Influenza (1918-1919) - Caught by Surprise

This was one of the deadliest outbreaks of an infectious disease that has ever affected mankind. About 40% of the world population, or 500 million people, were infected. According to some estimates, at least 50 million people were killed within 18 months. By comparison, the death toll from World War II was 8.3 million over four years. Not only was the virus virulent, it also displayed an unusual preference in its choice of victims. Mortality was highest among the young and healthy between the ages of 15 to 35. This meant that a large proportion of human resources responsible for a society's day-to-day functioning was down. Historical and epidemiologic data was inadequate to identify the geographic origin of the virus.

In Singapore: The outbreak occurred in two waves and about 2,870 people out of a population of 370,000 were killed³. The Government instituted a series of preventive measures e.g. infected persons were advised to seek treatment and isolate themselves, the public was asked to avoid crowded places and schools were closed for a week at the peak of the second wave.

Asian influenza (1957-1958) - Vigilance Paid Off

The pandemic originated in China and was less severe than the Spanish influenza pandemic because the virus was a milder strain and countries were better prepared by then. About 20% of the world population was infected and around 2 million people died.

In Singapore: There were 680 deaths in a population of 1.45 million. Schools were closed for almost two weeks because of illness and absenteeism, and the public was advised to stay away from crowded places. At healthcare facilities, elective surgery was minimised to free up staff to manage flu patients. Although no port quarantine measures were required by law, health checks were conducted on outbound passengers for airlines upon request.

³ Vernon J Lee, Chia Siong Wong, Paul A Tambyah, Jeffery Cutter, Mark I Chen, Kee Tai Goh. Twentieth Century Influenza Pandemics in Singapore. *Ann Acad Med Singapore* 2008;37:470-6.

HISTORY OF INFLUENZA PANDEMICS

Hong Kong Influenza (1967-1968) - Mild but Still Unpredictable

This pandemic, which originated in Hong Kong, was the mildest of the three pandemics, with a global death rate of about 1 million. Scientists attributed the low mortality to several factors. For example, as there were similarities between the Asian influenza and Hong Kong influenza viruses, people who were infected by Asian influenza likely built up some form of immunity. Another factor was that the pandemic gained momentum near the school holidays in December and therefore the rate of infection among school children and their families was low.

In Singapore: The virus which spread to Singapore in early August 1968 resulted in an outbreak that lasted a few weeks. About 540 people out of a population of 2 million were killed. Because of the relatively mild virus and the short length of the outbreak, no substantial measures were adopted. The Ministries of Health and Education considered the closure of schools but decided against it because of the waning of the pandemic.

Treatment Options

i. Antivirals

Currently, two antivirals - Tamiflu and Relenza - have proven to be effective in treating seasonal influenza. However, their efficacy in treating pandemic influenza remains uncertain. Some avian influenza strains, including the highly lethal H5N1, have begun to show resistance to antiviral treatment. Despite this risk, stockpiling is still prudent because of the reasonable chance that antivirals will work effectively. Research has also shown that Tamiflu can be effective for prevention of infection i.e. prophylaxis⁴.

ii. Pre-pandemic vaccines

Pre-pandemic vaccines are produced and stockpiled before a pandemic occurs. They are the only measure with the potential to develop protection within the population before a pandemic. The availability of an effective pre-pandemic vaccine could potentially reduce the impact of a pandemic by reducing the severity of illness and death. Data from clinical trials of pre-pandemic H5N1 vaccines has shown that they can provide some cross-protection against genetically different H5N1 strains, although the degree of cross-protection is unknown. However, it is uncertain if the next pandemic will be caused by the H5N1 subtype.

⁴ Prophylaxis is a medical measure that is intended to prevent a disease rather than to treat it. Prophylactic measures can generally be divided into pre-exposure prophylaxis and post-exposure prophylaxis.

If it is caused by other subtypes e.g. H9N2 or H7N7, the vaccines will not be effective. The shelf life of pre-pandemic vaccines is also relatively short, about 2 to 3 years.

iii. Pandemic vaccines

Pandemic vaccines are highly specific to the influenza strain and can only be developed after the new strain emerges. After the new strain is identified, it will take approximately 4 to 6 months for the first vaccines to be available internationally. By then, it is highly likely that the first wave of the pandemic will be over. As Singapore does not have vaccine manufacturing capacity, we will have to wait between 9 and 12 months before we can receive our order of pandemic vaccines. Therefore, it is not viable for the Government to prepare for vaccination during a pandemic. Instead, the more practical approach is to rely on a combination of Tamiflu treatment and non-pharmaceutical measures such as social distancing at the community level, and good personal hygiene at the individual level. If a pandemic occurs in waves, a vaccine that becomes available after the first wave can help to mitigate the impact of subsequent waves.

iv. Seasonal influenza vaccines

Seasonal influenza vaccines that are produced each year will not protect against pandemic influenza. However, WHO recommends that people who are at risk of exposure to the H5N1 virus be vaccinated against seasonal influenza. This will reduce the chances of a high-risk person being infected simultaneously

with avian and human influenza viruses, which could lead to the emergence of a novel virus with pandemic potential.

Impact on Singapore

Although there has been significant progress in modern medicine since the last influenza pandemic, experts believe that the world's defences against a killer strain are not strong. Today, with greater connectivity among countries and higher living density of populations, we can expect the virus to spread more rapidly around the globe. No country, including Singapore, can expect to be safe from infection. The potential impact on Singapore can be summarised as follows:

i. Impact on public health system

Singapore's public health system will experience reduced levels of service and care as it mobilises its resources to deal with a pandemic. An influx of influenza patients at hospitals and clinics will mean that many other patients with less urgent medical problems will have to wait for treatment. For example, those seeking elective surgery may have to wait until the pandemic ends in Singapore. During the peak of a pandemic, there could be a shortage of medical professionals because they may also be affected by the pandemic. In addition, the national healthcare system will have to prioritise life saving resources such as medicine and medical equipment due to shortages. Like other business sectors, hospitals, clinics and other

public health providers will face high staff absenteeism rate and encounter difficulties in maintaining normal operations. This will result in a further reduction in the level of service capacity.

ii. Impact on economy

The main economic impact of the SARS outbreak was on the demand side, as consumption and the demand for services declined. An influenza pandemic, however, will also impact the supply side as the workforce becomes smaller due to absenteeism. This will affect the operations of businesses locally and internationally, supply chains, flow of goods worldwide and provision of services. Some of these economic effects will worsen the public health situation in the absence of proper planning. For example, hospitals will be affected by supply chain disruptions. The following are some possible effects on the economy:

- Businesses will lose employees for long periods of time due to factors such as illness, the need to care for family members and fear of infection at work. Absenteeism rate could be as high as 40% in a severe pandemic;
- Businesses may not have access to their foreign workforces due to travel restrictions levied by other countries;
- The tourism industry and related industries e.g. transport and retail will be severely hit due to a

significant reduction in both tourist and business travel;

- The manufacturing industry will experience supply chain disruptions and reduction in demand for products;
- Operations at the Port of Singapore will be affected by the slowdown in global trade;
- Singapore companies with businesses overseas will have their operations impacted, particularly in countries less prepared or equipped to cope with a pandemic;
- Financial and credit markets worldwide will be affected by the loss of public confidence and reduced floor trading.

iii. Impact on society

The psychological impact of a pandemic may be longer lasting. The most immediate and tragic impact will be the loss of loved ones. Social distancing measures will also have a psychological impact. Singaporeans can expect to be asked to stay home for a period of time to prevent infection. Schools may have to be closed during the pandemic. Non-essential public places are likely to be closed and public events are likely to be cancelled to prevent close contact among people. Food supplies may be affected due to disruptions in imports

or closing of food establishments. This could result in the rationing of certain food products. In addition, the economic slowdown will affect overall employment and personal income. Some households will require financial assistance.

Planning Parameters and Assumptions

Pandemics are unpredictable. Although past influenza pandemics are useful benchmarks, it is impossible to know in advance the characteristics of the next pandemic. The Government must therefore make assumptions based on the past pandemics, scientific evidence, expert opinion and findings from modelling work. We also take into account factors such as epidemiology of avian influenza, speed of international travel and economic interdependencies among countries. These assumptions are not predictions of the next pandemic, but rather working estimates to guide national planning and decision making during the first weeks of a pandemic when information about the virus is limited and highly uncertain. Government agencies and private organisations are encouraged to adopt these planning assumptions so that their plans are consistent with the national strategy.

Origins of a Pandemic

- Although a pandemic virus could develop anywhere, it is most likely to emerge from Asia based on the pandemics in 1957 and 1968. The close proximity of humans to poultry, pigs and domestic animals in some countries facilitates commingling of human and animal viruses, and increases the risk of a pandemic virus emerging;
- While it may be theoretically possible to contain the initial spread of a pandemic virus originating in rural

parts of Asia, the measures required to do so are likely to be difficult to implement;

- An outbreak of one or more clusters in a neighbouring country or a country with significant trade and travel links with Singapore will almost immediately impact us.

Timing and Duration

- A pandemic could occur at any time. Intervals between the past pandemics have varied from about

10 to 40 years with no recognisable pattern. The last pandemic occurred in 1968-1969;

- It may occur in multiple waves, each lasting about six weeks. The waves will occur either within the same year or in successive influenza seasons. The second wave may be worse than the first;
- The warning period (i.e. the time between the detection of a novel virus outside of Singapore and the onset of a pandemic in Singapore) is assumed to be two weeks in the absence of intervention measures.

Geographical Spread

- Susceptibility to the pandemic will be universal. It is unlikely that any country can prevent the entry of the virus except through early closure of all borders or quarantine of all entrants for a long period of time;
- Spread of the virus from the country of origin is likely to follow the main routes of travel and trade. Country-to-country spread is likely to be rapid, although Singapore can delay the entry of virus given its limited number of ports of entry. However, this is only possible if we take early aggressive measures;
- Global spread may not follow the traditional time-phasing of seasonal influenza e.g. during winter for temperate climates. Businesses with overseas operations or trade with foreign partners should expect significant disruptions in multiple locations simultaneously.

Infectivity and Mode of Spread

- The virus typically spreads through droplets of respiratory secretions, or physical contact with a person or a surface that has been contaminated;
- Wearing of a face mask is encouraged because of its ability to prevent droplet contamination. At a minimal, surgical face masks should be worn. Those who will be in close contact with suspected or infected cases are advised to wear N95 masks;
- Incubation period (i.e. time between infection and the onset of symptoms) is typically two days with a range of one to four days;
- An infected person will be infectious from about one day before the onset of symptoms till three to five days after the onset of symptoms;
- Children shed more virus and over a longer period of time compared to adults. They may shed virus for up to three weeks;
- On average, an infected person will spread the virus to two other people. This is assuming no significant intervention and no human immunity. The number is likely to be higher in closed communities such as schools, dormitories, military camps and nursing homes;

- Symptomatic adults will be isolated for at least 5 days. This allows them to rest and to reduce their exposure to healthy individuals;
- People who are asymptomatic will still shed virus and are likely to be infectious to some extent. Because of the ability of asymptomatic people to spread the virus, family members and others who have had close contact with symptomatic patients will be asked to observe home quarantine until it is no longer practical or effective to do so.

Attack Rate and Susceptibility

- About 25% of the Singapore population will be infected and symptomatic;
- People of all ages are susceptible, but some people are at higher risk than others e.g. children, healthcare workers and people with medical conditions such as asthma.

Treatment and Prophylaxis

- Tamiflu is assumed to have 50% efficacy in prevention of complications. However, influenza that develops antiviral resistance may significantly reduce treatment efficacy;
- Health authorities will provide Tamiflu to individuals who have influenza symptoms. Businesses, particularly those in essential sectors, are encouraged to stockpile

Tamiflu for distribution to their staff as a preventive measure;

- Although a pandemic vaccine can be produced about 4 to 6 months after a pandemic starts, Singapore may have to wait between 9 and 12 months before we receive the vaccine as we do not have any vaccine manufacturing capacity in Singapore;
- Pandemic vaccines are estimated to have at least 70% efficacy. Other vaccines, such as seasonal and pre-pandemic vaccines, are assumed to have limited or no efficacy against pandemic influenza;
- Because of the absence of a reliable pharmacological treatment, Singapore will rely on a combination of Tamiflu treatment and non-pharmaceutical measures such as travel restrictions and social distancing.

Staff Absenteeism

- Businesses should plan for as high as 40% or more of their workforce to be absent for a prolonged period over the course of a six-week pandemic;
- Absenteeism for individual businesses may not be spread evenly over the course of the pandemic, with potentially as high as 40% of employees being absent simultaneously.

Timing of Government Actions

The exact nature of the pandemic influenza that we will face may not be known during the first few days of its development. This could be due to factors such as lack of data, weak global surveillance systems and lack of transparency in affected countries. Even when the strain of pandemic virus is identified, it will take some time to determine both its speed of transmission and lethality. The next pandemic will also emerge in an environment that is different from that of past pandemics. The world has become more interconnected with the movement of persons and goods occurring far more rapidly and more frequently than ever before. As a result, a pandemic today could spread more rapidly and have greater impact than past pandemics.

Given the uncertainty during the early onset of a pandemic and its potential severity, the Government assumes high virulence and population susceptibility during the initial period. It provides early triggers for aggressive measures, which will be significantly relaxed and scaled back when the virus is determined to be of milder virulence. If the virus originates in a country with few travel links to Singapore, the Government will take minimal actions in the early period. We will closely monitor the situation and increase our measures if necessary.

These planning parameters and assumptions will serve as a baseline until reliable information is obtained on the epidemiology of the disease, which may take

weeks after emergence of the first cluster of patients. As the Government receives more information, we will update these parameters and assumptions and revise the national response plans accordingly.

National Response Plan – An Overview

An influenza pandemic is a serious and enduring threat which requires continuous planning as well as validating and updating of plans through exercises. This chapter provides an overview of Singapore's preparations and activities to date and the response measures which the Government is developing to support a multi-layered defence against pandemic influenza.

Government Planning Activities

Over the past few years, the Government has developed contingency plans and conducted a series of exercises and drills to prepare the Government machinery for a pandemic. The following is a summary of the key milestones in Singapore's preparations:

2004 - Government-wide Pandemic Preparedness. Coordinated Government planning for a pandemic commenced in 2004. The planning drew on lessons learnt from the SARS outbreak in 2003;

2005 - Influenza Pandemic Readiness and Response Plan. Published by the Ministry of Health (MOH), this plan documents the public health

procedures for dealing with a pandemic e.g. handling and treating of infected cases, managing and tracing asymptomatic individuals who have been in contact with patients. The plan is regularly updated to include new information and developments;

May 2006 - Exercise Zenith II. This was a major table-top exercise which tested the capacity and response plans of Government agencies, in particular those responsible for critical essential services such as power, water, food, public order and security. Participating agencies discussed policy and operation challenges that might arise from a worst case scenario. Following the exercise, the agencies re-evaluated their planning assumptions and refined their plans;

July 2006 - Exercise Sparrowhawk II. This was a two-day nationwide pandemic simulation exercise to test the readiness and response plans at restructured hospitals, polyclinics, General Practitioner clinics, schools and border checkpoints including Changi International Airport. The procedures tested included temperature taking, triaging and isolation of suspected cases, and transfer of patients to the influenza-designated hospital;

Oct 2006 - Exercise Gallus IV. Since 2004, the Agri-Food and Veterinary Authority (AVA) has conducted a series of exercises (known as Exercise Gallus) to test its contingency plan to prepare for a bird flu outbreak in a local poultry farm. Ex Gallus IV was the first time that AVA called up external cullers from the commercial sector (e.g. poultry slaughterhouses, construction companies etc) to act as a second line of support for its own officers. The external cullers were trained in the proper use of personal protective equipment (PPE) and handling of chickens;

Nov 2006 - Exercise Gateway. This was a table-top exercise which explored non-pharmaceutical measures that could be taken to delay the entry of the virus into Singapore and to minimise the spread within the community. Measures considered included border restrictions and social distancing;

2007 - Development of non-pharmaceutical measures. The Government initiated inter-agency groups to develop operational mechanisms for border restrictions and social distancing measures. These

groups also identified interdependencies among Government agencies, as well as between the agencies and the private sector. Work in these areas is still in progress;

Jan 2008 - Exercise Gallus V. This exercise tested AVA's readiness to deal with an incursion of bird flu at Tuas Checkpoint. The scenario involved a truckload of chickens which was suspected to be infected. The truck was escorted by police to a nearby site for culling;

Aug-Sep 2008 - Exercise Raffles II. This was a two-week industry-wide exercise to test the financial sector's response to an influenza pandemic. It involved more than 140 financial institutions. The exercise was designed to enhance understanding of the risks posed by a pandemic. It also enabled participating financial institutions to exercise their crisis communications and business continuity plans to meet expected delivery of essential services as well as to protect and monitor the health of their employees and business stakeholders. The exercise consisted of two interactive table-top sessions, a practical drill and cluster discussions.

Response Measures

Singapore's response plan assumes high virulence and population susceptibility during the initial period of uncertainty and provides early triggers for aggressive measures. If the pandemic virus is determined with certainty to be of lower virulence, the measures will be scaled back. This section gives an overview of the multi-

faceted response measures that the Government will consider or adopt during a pandemic. When developing these measures, the Government has considered a number of key limiting and enabling factors to address the practicality, costs and benefits of these actions.

1. International Disease Surveillance

Effective disease surveillance and rapid containment of the virus in localised areas are extremely helpful in preventing the spread of the disease from one country to another. Currently, the state of preparations in countries is uneven. The level of risk is also different. For example, countries are at higher risk if they have experienced recurring outbreaks among animals and a number of human cases. High-risk countries often require more resources or expertise to undertake comprehensive surveillance.

Key Considerations

i. The emergence of a pandemic virus may not be rapidly detected because of challenges with disease surveillance

After the emergence of a new virulent strain, there is a short window of opportunity after which it will be impossible to prevent a global outbreak. Preventing a pandemic depends first and foremost on the capacity of countries to rapidly identify and contain new outbreaks. However, international surveillance and containment capabilities are currently insufficient to prevent a rapid

outbreak. There must be greater awareness of the threat of influenza among countries, more transparency in global disease surveillance and reporting, sharing of virus samples as well as the building of global health capacity.

ii. The pandemic virus is likely to emerge from interaction of animal and human influenza viruses.

Since a new pandemic strain is likely to arise from the interaction of human and animal influenza viruses, it is important to monitor closely highly pathogenic viruses in poultry for changes that could indicate an elevated threat to humans.

Measures to Improve Disease Surveillance

i. Assist in strengthening regional capacity for disease surveillance and containment

Singapore is working with the international community to help high-risk countries develop expertise, resources and plans that will enable early detection and reporting of disease. The Government is also working with international bodies to help countries develop effective containment strategies for the initial outbreak of pandemic influenza.

ii. Monitor and analyse information on outbreaks

Besides official reports, we also monitor non-official

reports from the public health community e.g. forums and weblogs. These reports will help us make initial determination of a potential pandemic, thus obtaining early warning before official announcements. Our analysis of information will be guided by a set of weak signals that may indicate that a pandemic is underway. These weak signals are important as laboratory confirmation of a new subtype that has pandemic potential could take several weeks. The weak signals include:

- A long lapse between occurrence of cases and media reports. This could suggest a possible delay in reporting by local authorities or a weak surveillance system;
- No animal source of virus. If public health investigations do not identify an animal source for the virus, this increases the likelihood that it has spread directly from human to human;
- Evidence of second-generation of infected persons i.e. the index case spreads the virus to a number of people (first generation), who in turn pass the virus to others (second generation). The general rule is that 10 days without new infections must pass to indicate that the chain of transmission has been broken;
- Simultaneous outbreaks in different regions. This may indicate rapid transmissibility of the virus among humans.

2. Animal Health Measures

Potential routes for the introduction of the highly pathogenic avian influenza (HPAI) virus into Singapore include the migration of wild birds or unauthorised import of poultry, birds or avian products (e.g. eggs). To detect the presence of the HPAI virus, AVA carries out regular surveillance of:

- Poultry in local poultry farms;
- Imported poultry, birds and eggs;
- Migratory birds in nature reserves (e.g. Sungei Buloh Wetland Reserve);
- Residential birds⁵ (e.g. pest birds such as crows and pigeons);
- Ornamental and pet birds in bird shops/farms/holding premises;
- Birds in the zoo and bird park

AVA has also implemented a series of multi-layered control measures that include:

- Control measures at source (e.g. ban import of birds, poultry and poultry products from infected countries);
- Border control measures (e.g. increased checks at entry points);
- Local control measures (e.g. strict biosecurity in local poultry farms);
- Emergency preparedness

⁵ Residential birds, unlike migratory birds, stay in Singapore all year round and do not migrate.

A key measure is the implementation of strict biosecurity measures in local poultry farms (especially bird proofing of poultry houses) to prevent any contact between migratory birds and poultry. AVA has also implemented measures to remove, limit or control backyard poultry. A contingency plan has also been developed for the culling of infected birds and poultry in the event of an HPAI outbreak in Singapore. The plan includes stockpiling essential equipment and supplies such as PPE and drawing up contracts with commercial companies to provide manpower and logistic support for the culling operations. AVA has also carried out a number of exercises to test its contingency plan.

3. Border Restrictions

Border restrictions can help delay the entry of the virus into Singapore by significantly limiting the number of travellers coming in. Unlike larger countries with multiple and more porous borders, Singapore's limited ports of entry, strong border control system and island geography enable us to adopt more aggressive passenger screening in addition to thermal scanning.

Currently, many countries rely primarily on thermal scanning at the borders to prevent the spread of pandemic influenza. However, thermal scanning alone cannot identify all infected persons. Some infected individuals may not have fever or other symptoms when they pass through border checkpoints. Even though they are asymptomatic, they are still infectious. Therefore thermal scanning will not prevent asymptomatic individuals from bringing the virus into Singapore.

Singapore's border restriction policy will depend on the severity of a pandemic, balanced against the competing priorities of preventing a public health crisis and sustaining the economy and the population. During a mild pandemic, Singapore may put in place thermal scanning and require health declarations for all incoming travellers. In a more severe scenario, we will adopt strict measures that may include the monitoring of all visitors for several days, and the operation of cargo staging areas that will limit interaction between foreign workers delivering essential goods and cargo handlers in Singapore.

Key Considerations

i. It is practical and beneficial to aggressively delay the entry of the virus at the onset of a pandemic

Research and historical evidence suggests that aggressive border restrictions can delay the entry of the pandemic virus, thereby providing critical lead time for us to get ready our mitigation measures. The restrictions should be discontinued once the virus enters the community as they will no longer have any effect on the local outbreak. The impact from the transmission of the disease within the community will be far greater than that of any imported case.

ii. Although there are costs resulting from tough border restrictions, these are still lower than the costs of not imposing any restrictions

Border and travel restrictions will have political, economic, social and operational costs, and will require individuals and businesses to adapt to new requirements. However, not taking any action will lead to a high number of deaths, in addition to an equally drastic impact on the economy and society.

iii. Border restrictions must facilitate the entry of essential goods and essential travellers

Singapore has many interdependencies with countries where there have been H5N1 infections among humans. These interdependencies include areas such as production of energy and supply of essential goods such as medical supplies and food items. Singapore also relies on foreign workers from the region for our industries and some essential services. This means that border controls must continue to facilitate the flow of essential goods and personnel into Singapore.

Border Restriction Measures

i. Travel restrictions

We are developing operational plans to enable a system for processing travellers from countries experiencing outbreaks or at risk of outbreaks. These travellers may be closely monitored for several days, after which they could be tested for the pandemic virus. Travellers with no homes in Singapore may be monitored at Government-operated facilities, while those with

homes (e.g. returning Singaporeans and Permanent Residents) will be asked to observe home quarantine.

Travel across land borders may also be slowed due to increased medical checks and the possible need, in severe cases, for monitoring of individuals who have crossed into Singapore. We will work closely with neighbouring countries to ensure that the mutual benefits of reduced disease spread are properly balanced against the need for efficient trade and border transit.

As concern about the situation increases, passenger flights and sea vessel trips may be reduced. Any unilateral action to cancel flights will be taken in a manner consistent with international agreements, and upon mutual agreement with other countries or through an international framework. Due to possible restrictions on the movement of foreign workers, businesses will need to develop plans to deal with shortage of labour.

ii. Visa requirements

Visa requirements will complement the travel restrictions by reducing travel to Singapore from countries experiencing outbreaks or at high risk of outbreaks. This will reduce the workload from processing and screening passengers for the pandemic virus. The visa regime for countries whose nationals require a visa to enter Singapore will be tightened to identify essential travellers by determining the reason for travel. Additional visa requirements could also be imposed. An example is a visa interview conducted several days before travel to significantly reduce the

possibility that individuals from an affected country travel to Singapore via a third country, carrying the virus with them without detection.

We will work with countries which currently enjoy visa-free travel to Singapore to identify appropriate measures that not only take into account the large number of travellers into Singapore, but also effectively minimise the chance of virus spread either to or from Singapore. Such measures could include the prioritisation of border crossings to ensure that the volume does not overwhelm Singapore's capacity to monitor and prevent transmission of the disease across the border.

iii. Cargo staging areas

Depending on the virulence of the virus, Singapore will consider setting up cargo staging areas to facilitate the entry of goods and to minimise contact between workers in Singapore and foreign truck drivers who may be infected. Cargo staging areas will help to sustain trade during periods when Singapore or its trading partners are affected by the pandemic. Staging area operations will prioritise essential goods, particularly food shipments. Strict infection control procedures will be observed, including thermal scanning, use of personal protective equipment and regular decontamination.

When to Activate Border Restrictions?

In order to be maximally effective, border restrictions must be implemented during the early stages of a

pandemic, when WHO confirmation may be pending and information about the virus is largely uncertain. Border restrictions must be adopted in tandem with an active disease surveillance system to rapidly identify infected individuals who are not detected by the border screening process, followed by aggressive tracing of contacts and social distancing to prevent further outbreaks within Singapore. Border restrictions will be maintained until more information about the disease becomes available, after which an assessment will be made on continuing some restrictions. When there is community-wide outbreak, the overall focus of our response efforts will shift to sustaining the population.

Who are Subjected to Border Restrictions?

All travellers entering Singapore, including returning citizens, Permanent Residents and other foreigners, will be subjected to border restrictions. When Singapore is experiencing a highly lethal outbreak, travellers exiting Singapore will also be subjected to border restrictions. They may be monitored for infection for several days before being allowed to leave the country. Similarly, cargo staging areas may be set up to prevent workers in Singapore from spreading the virus to visiting truckers and maritime crews. It is part of Singapore's obligation as a responsible global citizen to take such prudent measures to minimise the threat of pandemic to other countries.

4. Medical Response

During a pandemic, protecting human health is of utmost importance. If we fail to reduce mortality as far as possible, our effectiveness in mitigating the economic and social costs of a pandemic will also be limited. The public health community plays a central role in Singapore's medical response by leading efforts to detect early and to treat all influenza-like cases, monitor asymptomatic individuals who have been exposed to influenza cases, and deliver vaccine when it becomes available to the public.

Medical Measures

The Ministry of Health has published an **Influenza Pandemic Readiness and Response Plan** which is a comprehensive guide on Singapore's medical response. The Plan, which is updated regularly, can be found at <http://www.moh.gov.sg> and <http://www.crisis.gov.sg>. The following is a summary of some of the key components of the plan:

i. Surveillance

Early detection is vital to our ability to contain or eliminate an initial outbreak in Singapore. We have developed a multi-layered surveillance system aimed at detecting the first few cases or unusual clusters of influenza in animals or humans. Once an outbreak

occurs in Singapore, the monitoring and reporting of cases will intensify so that the real-time trajectory of the virus can be tracked and ring fencing⁶ measures applied to prevent further spread of the virus. Ring fencing will be carried out till it no longer has an impact on the transmission of the virus or is no longer operationally feasible.

Singapore's influenza surveillance system has a number of operational components. These include community-wide reporting of acute respiratory infections (which are indications of influenza) in hospitals and polyclinics, laboratory testing of influenza viruses to detect new strains, and veterinary surveillance to detect if avian influenza occurs in the poultry or wild bird populations. Early detection of the pandemic virus will enable us to reduce the number of people whom affected cases may come into contact with.

ii. Isolation and management of influenza cases

Tan Tock Seng Hospital (TTSH), including the Communicable Disease Centre (CDC), is the designated treatment facility for any case of potentially infectious disease. During the pre-pandemic phase, clinics and step down care facilities will refer suspect cases to TTSH Emergency Department for assessment and admission, if necessary⁷. Hospitals will isolate all suspect cases and transfer confirmed cases to TTSH/CDC. Confirmed cases, including children and pregnant

⁶ Ring fencing is the process of containing an outbreak in specific locations through isolation of infected cases and quarantine of close contacts. Ring fencing is only possible when the outbreak is still localised in specific areas. Once there is general spread of the virus into the community, it will not be possible to ring fence the outbreak.

⁷ Anyone who refuses to be admitted will be compelled to do so under Section 8(1) of the Infectious Diseases Act.

women, will be centrally managed at TTSH/CDC. TTSH / CDC will continue to be the dedicated hospital for influenza cases as long as it is operationally feasible. When it reaches full capacity, MOH will designate other restructured hospitals to accept the cases.

During a pandemic, both restructured hospitals and private hospitals will need to manage influenza and non-influenza cases. MOH will also instruct all polyclinics and participating primary care clinics⁸ to establish Flu Clinics to treat the expected surge in cases. The public will be educated on the symptoms of influenza and advised to go to the Flu Clinics first for assessment. The Flu Clinics will establish a separate workflow away from chronic and other non-influenza patients.

iii. Treatment of influenza cases with antivirals

Singapore has stockpiled the antiviral Tamiflu to treat about 25% of the population that is expected to be infected and symptomatic. Treatment should be initiated within 48 hours of the onset of symptoms. Duration of treatment is 5 days. Tamiflu will be prescribed through a network of General Practitioner clinics and polyclinics across Singapore. This network will prevent instances of delayed treatment due to lack of transportation or other logistical problems that may arise during a pandemic. The public will be instructed on where they can get treatment. Singapore's stockpile of Tamiflu will predominantly be reserved for treatment and not prophylaxis i.e. prevention of infection. Businesses that

require prophylaxis of their essential workforce should create their own stockpiles sufficient for at least 40 days.

iv. Tracing, quarantine and prophylaxis of asymptomatic contacts

During the initial period of an outbreak, all contacts of confirmed cases will be identified and monitored (i.e. contact tracing), put on home quarantine and provided with antivirals for post-exposure prophylaxis as a preventive measure. The quarantine process will be similar to that adopted during the SARS outbreak, except that recovered cases will not require quarantine. The management and tracing of contacts will continue until it no longer has an impact on the transmission of the disease within the community or is not operationally feasible. This happens when there are large numbers of infected cases affecting multiple areas of Singapore.

v. Use of influenza pandemic vaccines

Singapore has placed an order for pandemic vaccine for the entire population, which we can expect to receive only 9 to 12 months after the pandemic virus is identified. Initially when vaccines are in short supply, vaccination will be provided to priority groups such as those at higher risk of complications and those who provide essential services. As the vaccines become more readily available, vaccination will be extended to the rest of the population.

⁸ Primary care clinics broadly encompass community-based General Practitioner clinics and paediatric clinics (i.e. non-hospital/ medical centre based).

vi. Use of pre-pandemic vaccines

Singapore is stockpiling pre-pandemic H5N1 vaccines. This will be given to essential personnel, children aged 6 months to Primary 6 and persons at higher risk of developing complications. This will help maintain essential services, reduce influenza transmission in the community and protect persons at higher risk of developing complications. As persons at higher risk of complications will potentially be hospitalised, protecting them will help reduce the load on hospitals.

5. Social Distancing

Social distancing aims to reduce the extent of physical interaction among people. The primary goal is to lower overall morbidity and mortality, thereby reducing the potential for overloading the healthcare system. If instituted immediately after the discovery of the pandemic virus in Singapore, it can help slow the speed of transmission of the virus. Social distancing is an important complement to other efforts such as disease surveillance, treatment, home quarantine and infection control, all of which will work in concert to reduce the impact of a pandemic on Singapore.

Key Considerations

i. Public awareness and compliance is critical for social distancing

Measures such as extended closure of schools and

non-essential public places will affect the population. Individuals should make necessary arrangements such as childcare plan and stockpiling of essential items in order to mitigate the disruptions to their daily routines. Public compliance and cooperation is also needed to ensure effective implementation of social distancing measures

ii. Public morale will be affected

In addition to the deaths and illness resulting from a pandemic, public morale will be affected by restrictions on social interaction and normal activities which the population is accustomed to. Certain groups such as elderly people with no families will also need more assistance during this period.

Social Distancing Measures

i. School closure

School closure is widely viewed as an effective measure for reducing the spread of pandemic influenza not only within schools but also within an entire community. Lessons from the Spanish influenza pandemic show that school closure had helped to reduce the rate of community-wide infection. Reducing child-to-child interaction will not only break the fast-acting chain of transmission in schools, but will also reduce the spread of disease from children to adults.

Schools across Singapore could close when there is confirmed entry of a highly lethal pandemic virus or

during the initial stages of a pandemic when lethality may be uncertain. Selective school closure (i.e. closing only those schools with infected children) will be considered if the virus is determined with a high degree of certainty to be significantly less lethal than the Government's baseline planning assumptions. For extended school closure, students will continue to receive education through mediums such as the Internet, broadcast media, digital medium (e.g. CD-ROM) or print medium delivered through postal services.

When schools are closed, working parents of young children will have to make alternative childcare plans during the normal workdays. Creating childcare groups is one way to share the burden among parents. However, these groups should be kept small to reduce the probability of disease spread. When a pandemic progresses, childcare requirements will likely be eased to some extent since parents and relatives may also be telecommuting. For older children and teenagers, parents will be advised to ensure that they do not congregate in large groups outside of school.

ii. Closure of non-essential public places, cancellation of mass gatherings

Public places such as shopping malls, entertainment outlets and places of worship are potential locations where the virus can spread rapidly due to close proximity of people. Historical experience shows that continued community interaction despite shutdown orders and direction to avoid public places will worsen the spread of the virus. In this regard, non-essential

public places (e.g. shopping malls, entertainment outlets) and events where crowds congregate (e.g. football matches, concerts and religious services) may have to be closed or cancelled to minimise social contact. This measure must be instituted at the early onset of an outbreak in order to be effective. Public places that sustain the community (e.g. eating outlets, supermarkets and provision shops) may have to remain open with preventive measures in place e.g. wearing of face masks. The public will be advised to stockpile and prepare food at home to minimise the need to visit food outlets.

iii. Limit access to closed communities

Closed communities such as nursing and welfare homes, prisons and drug rehabilitation centres will face a high risk of cross contamination due to close living space. Precautionary measures will have to be taken to prevent the virus from entering the closed communities and resulting in mass outbreaks. Besides tightening health checks, access to the closed communities will also be restricted to essential visitors e.g. doctors, counsellors and food suppliers. The number of family visits could be reduced or even stopped, depending on the situation.

iv. Declaration of “Stay Home Days”

The declaration of “Stay Home Days” will encourage the voluntary separation of people for short periods of time. All businesses, except those which deliver essential services to the population, will be advised to close for a number of days. This aims to minimise virus

transmission without explicit activity restrictions. Such a measure was an important strategy in mitigating the spread of the virus in some US cities during the Spanish influenza pandemic in 1918 and the polio epidemic in the 1950s. The Government may announce periodic series of “Stay Home Days” if a highly lethal virus spreads within Singapore. The duration will depend on the characteristics of the disease and an assessment of the social sustainability of the measure. Provisions will be made to sustain the community during ‘Stay Home Days’ and the entire pandemic period.

v. Declaration of Public Health Emergency

The Infectious Diseases Act (IDA) enables the Minister for Health to declare a Public Health Emergency (PHE) when there is a major infectious disease outbreak that is likely to cause significant number of deaths or severe disabilities. A PHE may also be declared when there is a threat of an imminent outbreak of such a disease. When a PHE is declared, the IDA gives the Minister for Health powers to close establishments e.g. places of entertainment and / or prevent public gatherings to minimise the spread of the infectious disease through social distancing. He may also requisition private resources, including manpower resources, necessary to control the outbreak.

6. Continuity of Essential Services

A pandemic is likely to create considerable challenges for the provision of essential services such

as food, water and energy to the population. Although continuity plans are in place to ensure that essential services are maintained during emergencies such as a terrorist attack, these plans have to be adapted for an influenza pandemic, where the prolonged effects will continuously and increasingly remove personnel from essential industries.

Key Consideration

Many human resources will not be available after a pandemic outbreak in Singapore.

An influenza pandemic is different from other crises such as a terrorist attack or an earthquake. It does not affect physical infrastructure such as buildings and computer networks, but it threatens human resources by removing employees for long periods of time. This impact is broad-based and will hit all industries including critical sectors.

What are Essential Services?

The Government has identified the following nine services as essential:

i. Food Supply – Since Singapore imports most of its food, the Government is developing plans to expand the sources of food supplies, stockpile food and develop strong transportation and distribution systems;

ii. Water Supply – Sector stakeholders will implement measures to ensure that the operation of water purifying plants and maintenance of the distribution grid can be sustained;

iii. Energy Supply – Sector stakeholders will implement measures to ensure that electricity plants and oil refinery can be manned and operated when there is high worker absenteeism. The Government has also made arrangements to stockpile crude oil supplies as part of national emergency contingency planning;

iv. Waste Disposal – Sector stakeholders will implement measures to ensure that waste processing plants can be manned and operated when there is high worker absenteeism;

v. Mortuary Services – Special provisions will be implemented in the event of a high number of deaths and a reduction in mortuary services due to high worker absenteeism. Provisions are also planned for increased burial and cremation if there is a surge in pandemic-related fatalities;

vi. Financial Services – Financial stakeholders are planning measures to ensure continued flow of cash and to maintain proper functioning of payment systems and markets;

vii. Law Enforcement – The Government is developing special provisions to meet the increased law

enforcement demands that may arise from maintaining order, securing the transportation of essential goods (e.g. food and medicine), and protecting facilities such as hospitals;

viii. Info-communications⁹ – The Government is coordinating infrastructure capacity build-up to meet the potential surge in internet demand from households and businesses;

ix: Transportation and Trade Infrastructure¹⁰ – Priority will be placed on maintaining movement of essential goods and essential personnel while minimising face-to-face contact and implementing infection control measures. Special provisions will be made in the event that high worker absenteeism reduced capabilities.

Sector-Specific Continuity Plans

The Government will collaborate with specific agencies, essential service owners and providers as well as businesses in the individual sectors to develop sector-specific plans to ensure continuity of essential services. Each continuity plan will outline a sector's dependencies on other sectors and the impact it will face from the continuity measures taken by the other sectors.

⁹ Info-communications includes basic telephone, Internet and cable services

¹⁰ Transportation and trade infrastructure includes operation of the public transit system, the airport and the Port of Singapore

7. Provision of Social Support Services

A pandemic and the measures taken in response will create psychological and socio-economic impact on the population. The Government will take steps to maintain public morale and coordinate assistance for those in need, especially vulnerable populations such as the elderly and the disabled.

i. Organise activities to maintain morale and social resilience

A range of activities and advisories will be provided regularly through mass mediums such as television, radio, newspapers and Internet to help maintain morale and build social resilience. News programmes, entertainment and other programming will also be increased.

ii. Coordinate assistance to individuals and businesses

Some families will suffer a loss of income during a pandemic. Some businesses may be unable to continue operations or recover due to the drastic reduction in demand for goods and services, as well as Government measures such as closure of non-essential public places. The Government will coordinate assistance to these families and businesses.

iii. Coordinate additional services to vulnerable populations

Vulnerable populations such as the elderly, disabled and those requiring medical treatment such as dialysis will need support and assistance during a pandemic. The Government will coordinate additional services to these at-risk groups. These services may include the delivery of food and medicines to residences, and the active monitoring of at-risk individuals for signs of influenza or other illnesses.

Government Response Measures – Summary	
International Disease Surveillance	<ul style="list-style-type: none"> - Assist in strengthening regional capacity for disease surveillance and containment - Monitoring and analysis of information on outbreaks
Animal Health Measures	<ul style="list-style-type: none"> - Surveillance of local and imported poultry and ornamental birds as well as migratory wild birds - Prevent the importation and smuggling of birds, poultry and poultry products from infected countries - Established multi-layered control measures against bird flu - Developed contingency plan and taken measures to prepare for a bird flu outbreak in birds and poultry
Border Restrictions	<ul style="list-style-type: none"> - Monitoring of incoming travellers for a few days for signs of influenza - Cancellation of passenger flights and sea vessel trips - Tighten visa requirements for countries whose nationals require a visa to enter Singapore - Set up cargo staging areas to reduce face-to-face contact between foreign cargo handlers and workers in Singapore
Medical Response	<ul style="list-style-type: none"> - Intensify surveillance in Singapore - Isolate and manage influenza cases - Treat influenza cases with antivirals - Quarantine and contact trace till these measures no longer have an impact on the transmission of the virus or are no longer operationally feasible. - Distribute vaccine when it becomes available - Administer pre-pandemic vaccines to select groups

Government Response Measures – Summary	
Social Distancing	<ul style="list-style-type: none"> - Close schools - Close non-essential public places - Cancel large-scale public events - Limit access to closed communities e.g. nursing and welfare homes - Declare “Stay Home Days” - Declare Public Health Emergency
Continuity of Essential Services	<ul style="list-style-type: none"> - Activate continuity plans for nine critical sectors (food, water, energy, waste disposal, mortuary services, financial services, law enforcement, info-communications, and public transportation and trade infrastructure)
Provision of Social Support Services	<ul style="list-style-type: none"> - Provide activities and advisories regularly to maintain morale and build social resilience - Increase entertainment, news and other programming - Coordinate assistance to individuals and businesses affected by the pandemic - Coordinate services and assistance to at-risk populations, such as the elderly and disabled

Business Preparedness

The private sector needs to partner the Government to help sustain the economy and provide essential services to the population. Planning for a pandemic requires businesses to think about issues beyond those that they will consider in normal continuity planning. For example, unlike many emergencies, a pandemic may have prolonged effects on the delivery of many third-party services which businesses take for granted, such as postal and transport services. Due to its global nature, a pandemic will likely impact the flow of goods in and out of Singapore. Measures taken by the Government will ease but not eliminate many of the disruptions that businesses will face. Financial hardship will be likely but it can be significantly mitigated with a comprehensive Business Continuity Plan.

Impact on Businesses

i. Worker absenteeism

Infection is likely to spread rapidly in the workplace, leading to a surge in absenteeism. Apart from employees who fall sick, others may not go to work because of fear of infection or the need to stay home to look after family members. As a result, every business must ensure that its operations can be sustained under the strain of high absenteeism.

ii. Changes in work operations

During a pandemic, health officials will advise against close contact among people. This may require businesses

to separate their workforces into groups. For instance, one group could work from home, while another operate from the office. For businesses which require employees to congregate in close groups, arrangements will have to be made to ensure protection of the staff and continuity of business functions.

iii. Disruptions to global supply chains and delivery of services

Outbreaks in one country will have ripple effects throughout global supply chains, thereby disrupting the delivery of goods and services. An outbreak in Singapore will also strain the delivery of certain essential services which are critical to continuity of business operations. For example, Internet access speed may be slow as

telecommuters and school children require access for work and online education. Postal services may also suffer delays and changes in delivery schedules during the peak of a pandemic. While the Government and essential service providers will ensure the continuity of key services through the development of sector specific continuity plans, service degradations are very likely. Life and business may not go on as normal. Businesses should work with their key stakeholders including customers, suppliers and service providers, to review their interdependencies and to develop contingency plans.

iv. Movement restrictions

The continuity of business operations may also be adversely affected by Government-initiated policies here and abroad to restrict movement of persons. For example, businesses may not have access to their foreign workers because of cross-border travel restrictions, unless they plan to house these workers in Singapore for the duration of the pandemic. Travel restrictions and the public's fear of travel will also significantly impact any tourism-related business. Public transport in Singapore will likely remain in service though at reduced frequency. The Government may also seek to reduce peak loading through measures such as encouraging businesses to start their work day during off-peak times.

v. Macroeconomic effects

Businesses will be impacted by the expected global

downturn in trade, commerce and finance in the event of a global pandemic. Demand for products and services is likely to dip, as will access to credit and capital.

Business Preparations

All businesses should develop BCPs specifically for an influenza pandemic. Large and medium-sized businesses will benefit by employing an emergency management specialist to lead the development of BCPs and all businesses should have a Flu Manager to ensure that employees are familiar with the plans and comply with them during a pandemic. The following is a summary of preparations that businesses can make:

i. Human resource management

- Develop a continuity of leadership plan in the event of absence of key decision makers and executives;
- Identify critical business functions and essential staff. Businesses can begin cross-training workers to ensure that critical functions are maintained;
- For businesses with foreign workers who may be impacted by travel restrictions, develop continuity plans that may include provision of accommodation in Singapore for these workers for the entire duration of the pandemic;
- Develop a telecommuting plan which could include the provision of equipment to facilitate video

conferencing and Internet access from home;

- Develop a plan to grant temporary leave of absence to workers who are not critical to business operations and who are unable to work from home (e.g. staff doing recruitment and long-term budget planning);
- Establish flexible sick leave policies for a pandemic so that workers are encouraged to stay home if they become ill;
- Review health insurance policies for workers;
- Stagger working hours to reduce the exposure of employees to infected persons onboard public transportation during crowded peak times;
- For large and medium-sized businesses, create teams of workers who work in different offices or at different times. This will reduce contact between the teams and ensure continuity of operations when one team of workers fall sick or have to observe home quarantine.

ii. Occupational health measures

- Educate employees on infection control and good personal hygiene;
- Develop a medical surveillance plan to ensure the quick identification of individuals with fever or other influenza-like symptoms. Daily medical screening, thermal scanning and temperature-taking should be

considered, with the knowledge that these activities will not identify all influenza carriers;

- Stockpile infection control supplies such as masks, gloves and disinfectants;
- Stockpile Tamiflu for the purpose of protecting healthy essential workers from infection i.e. prophylaxis. A Tamiflu stockpile for such a purpose should include enough doses for at least 40 days per person.

iii. Relationships with suppliers, service providers and customers

- Identify essential suppliers and service providers, and discuss continuity issues with them;
- Identify essential customers and ensure that plans are in place to meet customer needs and to collect income.

iv. Communications

- Begin communication with employees before a pandemic occurs in order to set expectations. Employees should be aware of business policies that will impact them, such as medical monitoring and sick leave. Similarly, employers should assess whether employees have the resources at home to telecommute, and whether those who are required to commute to work will have the capacity or inclination to do so. Essential foreign workers

should be engaged on whether they can or will stay in Singapore for the entire duration of a pandemic;

- Develop a robust communications plan to track employee absenteeism so that critical functions are fully staffed on a daily basis;
- Begin a dialogue with key external stakeholders such as suppliers, service providers and customers on potential contingency measures during a pandemic;
- During a pandemic, ensure that workers receive timely information regarding business and Government policies and procedures, updates on

the outbreak situation and ways to reduce infection at the workplace.

The list of business preparations is not exhaustive and is meant only as a general guide. For more information on pandemic planning for businesses, refer to the recommended websites in Annex.

BUSINESS GUIDE FOR COPING WITH AN INFLUENZA PANDEMIC

Human Resource Management	Occupational Health Measures	Relationships with Suppliers, Service Providers & Customers	Communications
<ul style="list-style-type: none"> • Develop a continuity of leadership plan in the event of absence of key executives and decision makers • Identify critical business functions and essential staff, and cross-train staff so that essential functions are maintained • Plan for travel restrictions on foreign staff e.g. provide housing in Singapore for these workers • Develop a telecommuting plan which includes provision of equipment for video conferencing and telecommuting from home 	<ul style="list-style-type: none"> • Educate employees on infection control and good personal hygiene • Develop a medical surveillance plan to ensure the quick identification of individuals with fever or other influenza-like symptoms • Stockpile infection control supplies such as masks, gloves and disinfectants • Stockpile Tamiflu for the purpose of protecting healthy essential workers from infection. A Tamiflu stockpile for such a purpose should include enough doses for at least 40 days per person. 	<ul style="list-style-type: none"> • Identify essential suppliers and service providers, and discuss continuity issues with them • Identify essential customers and ensure that plans are in place to meet customer needs during a pandemic 	<ul style="list-style-type: none"> • Begin communication with staff before a pandemic occurs to set expectations e.g. assess if staff can telecommute or travel to work daily during a pandemic • Educate employees on policies or measures that will affect them e.g. medical monitoring, sick leave policy • Engage essential foreign workers on whether they can or will stay in Singapore for the entire duration of a pandemic

BUSINESS GUIDE FOR COPING WITH AN INFLUENZA PANDEMIC

Human Resource Management	Occupational Health Measures	Relationships with Suppliers, Service Providers & Customers	Communications
<ul style="list-style-type: none"> • Plan to grant temporary leave of absence to staff who are not critical to business operations and who are unable to work from home • Establish flexible sick leave policies for a pandemic so that employees are encouraged to stay home if they fall ill • Review staff health insurance policies • Stagger working hours to reduce the exposure of employees to infected persons onboard public transportation • Divide staff into teams and arrange for them to work in different offices or at different hours so that contact between the groups is minimised. 			<ul style="list-style-type: none"> • During a pandemic, disseminate timely and accurate information to staff on business and Government policies and procedures, updates on the outbreak and ways to reduce infection at the workplace • Develop a robust communications plan to track employee absenteeism so that critical functions are fully staffed on a daily basis • Begin a dialogue with key external stakeholders such as suppliers, service providers and customers on potential contingency measures during a pandemic.

Individual and Family Preparedness

For Singapore's response plans to be effective, the population must take actions now to be informed, participatory and self-sufficient. For example, individuals should learn more about pandemic influenza and ways of protecting themselves. They should also plan ahead for disruptions to daily schedules resulting from measures such as extended school closure and travel restrictions, and abide by Government directives during a pandemic.

Impact on Daily Lives

At the first signs of an outbreak in Singapore, the Government may initiate the closure of schools for weeks or possibly months. Parents will have to adjust their daily schedules, which will likely experience more disruptions when other social distancing measures are put in place. For example, individuals who are mildly sick will be advised to stay home. Depending on the virulence of the virus, the Government may also ask individuals who have been exposed to a sick person but who are not showing any signs of infection, to comply with a Home Quarantine Order and to minimise contact with other family members. Other possible social distancing measures include closure of non-

essential public places, cancellation of mass gatherings and declaration of 'Stay Home Days'. There is also the possibility that infections in the family may lead to the loss of income or a primary childcare provider, even if only for a temporary period of time.

Preparations before a Pandemic

i. Be informed

Individual and family preparedness begins with learning more about pandemic influenza. Everyone should know about the symptoms, ways of preventing infection and the Government's response plans. This will help debunk commonly-held misconceptions about

pandemic influenza, which could adversely affect how the community will behave during a pandemic. It is also important that the public obtain information only from official sources.

ii. Develop a family preparedness plan for the following:

Childcare and care of people with special needs e.g. the elderly and the disabled.

Some parents will need to arrange for alternative childcare during school closure. For families who have to settle for group childcare, they should ensure that these groups are kept small to reduce the risk of exposing the entire group to a child who is infected. For older children and teenagers, parents should advise them not to congregate at public places that may expose them to the disease. Parents should ensure that their children have access to the online learning programmes rolled out by schools and plan activities to keep younger children occupied. Arrangements should also be made for people with special needs, such as the elderly and the disabled, so that they will continue to have access to prescribed medications and medical care.

Working from home

Where feasible during a pandemic, individuals should telecommute as a means of avoiding close contact with co-workers. They should ensure that they have the necessary equipment at home for telecommuting such as computer and Internet access. Parents who

are working from home will need to coordinate their Internet use with their children, who will be receiving their lessons online. As telecommuting may not be feasible for certain occupations, individuals should find out from their employers about the working arrangements for a pandemic.

Stockpiling essential items

The public is encouraged to stockpile food, medicine and other essential items for two weeks or more to reduce the need to leave home and to deal with possible reductions in supply. Some of the food items that families may wish to stockpile include rice, instant noodles, canned meat, canned vegetables and biscuits. Families with infants should stockpile infant milk powder and other infant foods. Medical stockpile should include surgical masks, thermometers, fever medication and over-the-counter anti-histamines, lozenges and cough medicine. It should also include prescription medications for family members with chronic conditions.

What to do during a Pandemic

i. Seek immediate treatment if you fall sick

The public should seek treatment at a hospital or a Flu Clinic if they suffer from one or more of influenza symptoms such as fever, headache, tiredness, cough, sore throat, runny nose, body ache, diarrhoea and vomiting. Tamiflu will not be available over-the-counter but will be prescribed at hospitals and Flu Clinics. The public

should not purchase Tamiflu through other sources such as the Internet as such sources could be dubious and the Tamiflu acquired may not provide effective treatment.

Individuals who suffer from non-influenza, chronic conditions such as diabetes or heart disease should still seek treatment at clinics or hospitals if necessary. The physical separation of influenza and non-influenza medical facilities will prevent the interaction of influenza and non-influenza patients. During a pandemic, the Government will advise the public on where to seek treatment for influenza and non-influenza medical conditions.

ii. Stay home for at least five days if you feel ill or have a fever

After receiving treatment, individuals are advised to rest at home for at least 5 days. This will enable them to recover quickly and will prevent the spread of the virus to others. As children shed virus for a longer period than adults, they should stay home for a longer time as a precaution.

iii. Observe Home Quarantine Orders

If a person has been in contact with an influenza patient but is not showing symptoms, he may still be instructed to observe home quarantine. This is a crucial control measure since asymptomatic persons are still infectious.

iv. Exercise good personal hygiene including frequent hand washing

As influenza viruses most commonly spread through close contact, the best ways to avoid infection will be the frequent and thorough washing of hands, avoidance of hand-shaking, covering of the mouth when coughing, sneezing into tissues and keeping one's distance from other individuals.

v. Minimise social interaction

While many public places are likely to be closed, the Government is working with private businesses to ensure that those providing essential services, such as supermarkets and pharmacies, remain open. The public can avoid frequent travel to these places and exposure to potentially infected persons by stockpiling essential items and preparing most meals at home. Wearing of face masks is encouraged when using public transport and visiting crowded public places.

vi. Take precautions when handling pet birds

During a pandemic, AVA will issue advisories to the public on the handling of their pet birds. These will include advising pet owners to:

- ensure that their birds are properly biosecured (e.g. caged up) to prevent them from coming into contact with wild birds
- wash their hands properly after touching

- their birds or their secretions;
- surrender their pet birds to AVA if they do not wish to keep the birds and not release them into public areas.

What to do if you are overseas during a pandemic

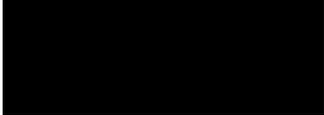
Some Singapore citizens will be living or travelling in a foreign country when a global pandemic first develops. Advice to Singaporeans abroad will depend on the local circumstances, including whether the local country or region is experiencing an outbreak and if that country or region has the capacity to contain an outbreak. As a general rule, Singaporeans will be encouraged to return to Singapore if they are in a country where there is limited capacity for containment or treatment. Singaporeans returning from infected

countries will be tested for influenza and required to observe home quarantine. If the affected country has sufficient plans for containing an outbreak and treating citizens and non-citizens alike, Singaporeans will be advised to follow the directions of the local Government on treatment, isolation, quarantine and other public health directives. Singaporeans should contact the Singapore embassy or consulate for advice. However, Singapore embassies and consulates are not equipped to treat or provide medication to Singaporeans living overseas.

The list of family preparations is not exhaustive and is meant only as a general guide. For more information on pandemic planning for individuals and families, please refer to “Flu Pandemic: A Guide for You and Your Family” at <http://www.crisis.gov.sg> and other recommended websites in Annex.

FAMILY GUIDE FOR COPING WITH AN INFLUENZA PANDEMIC

Before a Pandemic	During a Pandemic (If you are in Singapore)	During a Pandemic (If you are overseas)
<ul style="list-style-type: none"> • Learn more about pandemic influenza and Government measures which will affect the population • Find out about your employer's plans for a pandemic (e.g. childcare and medical policies, telecommuting) • Switch to internet-based transactions e.g. internet banking • Develop a family preparedness plan which covers the following: <ul style="list-style-type: none"> -> childcare -> care of people with special needs -> telecommuting, internet learning -> stockpiling of essential items (e.g. canned food, infant milk powder, medicine, face masks, detergent) • Take precautions when travelling to countries with outbreaks of avian influenza (e.g. avoid contact with poultry, avoid consumption of undercooked poultry and foods) • Vaccinate against seasonal influenza • Maintain a healthy lifestyle – eat healthily, exercise regularly and manage your stress 	<ul style="list-style-type: none"> • Monitor news on outbreaks and Government directives • Comply with Government directives on treatment, isolation, quarantine and other public health measures • Seek immediate treatment if you feel ill and rest at home • Maintain line of communication with your employer so that you are informed of management decisions • Practise infection control and good personal hygiene • Minimise social interaction • Take precautions when handling pet birds • Avoid travel to infected areas 	<p>Besides the measures and precautions listed in Column 2, seek advice from the Singapore embassy / consulate in your country of residence.</p> <p>E.g. Should you return to Singapore? What kind of measures will you be subjected to upon return to Singapore? Where can you seek treatment in the country of residence?</p>



Conclusion

An influenza pandemic could happen at any time, or it may never emerge. Despite the uncertainty, we cannot discount the possibility that a pandemic could potentially affect our entire country. Therefore, we must be prepared to live with this risk for a long time and to continue making preparations for a worst-case scenario.

The Singapore Government has adopted a risk management approach in dealing with an influenza pandemic. We strive to keep our preparations as flexible and sustainable as possible, without over-committing on resources. Our plans are deliberately kept adaptable so that they can be applied in other scenarios, for example, an outbreak of other infectious diseases or a terrorist attack.

We will continue engaging and working with the private sector and the public to raise the level of preparedness at the individual, community and national levels. It is only through this Whole-of-Singapore approach that we can build a robust, multi-layered defence against pandemic influenza.

Annex:

Resources on Pandemic Influenza and Pandemic Planning

Singapore Websites:

1. Ministry of Health (<http://www.moh.gov.sg>)
 - Influenza Pandemic Readiness and Response Plan
 - Guide on Infection Control Measures for Workplaces
 - Influenza Pandemic Guide for Step Down Institutions and Nursing Homes
 - A Guide to Organising a Primary Care Clinic during an Influenza Pandemic
2. Health Promotion Board (<http://www.hpb.gov.sg>)
3. Singapore Government's crisis website (<http://www.crisis.gov.sg>)
 - Flu Pandemic: A Guide for You and Your Family
 - A Flu Pandemic Business Continuity Guide for SMEs
4. Agri-Food and Veterinary Authority of Singapore (<http://www.ava.gov.sg>)

Foreign Websites:

1. World Health Organization (<http://www.who.int/en/>)
2. Centers for Disease Control and Prevention (<http://www.cdc.gov/flu>)
3. US Government's avian and pandemic influenza website (<http://www.pandemicflu.gov>)

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