Section Two

BACKGROUND

2.1 Epidemiology of Pandemic Influenza

Influenza A viruses periodically cause worldwide epidemics, or pandemics, with high rates of illness and death. A pandemic can occur at any time, with the potential to cause serious illness, death and colossal social and economic disruption throughout the world. Experts agree that future influenza pandemics are inevitable but the timing of the next pandemic cannot be predicted. Since there may be little warning, contingency planning is required to minimize the devastating effects of a pandemic.

Historic evidence suggests that pandemics occurred three to four times per century. In the last century there were three influenza pandemics ("Spanish flu" in 1918–19; "Asian flu" in 1957–58 and "Hong Kong flu" in 1968–69), separated by intervals of 11 to 44 years. The worst, in 1918–19, killed an estimated 30,000 to 50,000 people in Canada and 20 to 40 million people worldwide. During each of the last three pandemics, the greatest increase in death rates occurred among persons less than 60 years of age; in 1918–19, the greatest number of deaths occurred in those 20 to 40 years of age.

Certain conditions make an influenza pandemic more likely:

- a new influenza A virus arising from a major genetic change i.e., an antigenic shift;
- a susceptible population with little or no immunity;
- a virus that is transmitted efficiently from person to person; and
- a virulent virus with the capacity to cause serious illness and death.

It is thought that new influenza viruses capable of causing pandemics in human populations arise through genetic mixing (reassortment) between human and avian influenza viruses. Pigs, which can be infected with both human and avian influenza viruses, may act as vehicles for such reassortment events. However, in 1997 direct transmission of avian H5N1 influenza from chicken to humans was demonstrated in the Hong Kong "bird flu" incident, indicating that contact with pigs is not essential for human infection with an avian virus. The majority of new influenza strains emerge in Southeast Asia where large human populations have close interactions with pigs and domestic fowl. The probability of a new strain emerging in North America is thought to be relatively low.

Based on the last two pandemics, it is estimated that the next pandemic virus will be present in Canada within three months after it emerges in another part of the world, but could be much sooner due to increases in the volume and speed of global air travel. Upon arrival, the virus may spread across Canada with great speed. In 1918, returning soldiers with influenza traveling on trains carried the virus from Quebec to Vancouver within a few weeks. The first peak of illness in Canada may occur within 2 to 4 months after the virus arrives in Canada. The first peak in mortality is expected to be approximately one month after the peak in illness. Based on past pandemics, in temperate climates when the pandemic virus arrives close to the usual annual influenza season (November to April) the interval from the arrival of the virus to the height of the epidemic can be very short.

In addition, it has been observed that an influenza pandemic usually spreads in two or more waves, either in the same year or in successive influenza seasons. A second wave may occur within three to nine months of the initial outbreak wave and may cause more serious illnesses and deaths than the first. In any locality, the length of each wave of illness is likely to be six to eight weeks.

2.2 Estimated Impact of an Influenza Pandemic on Canadians

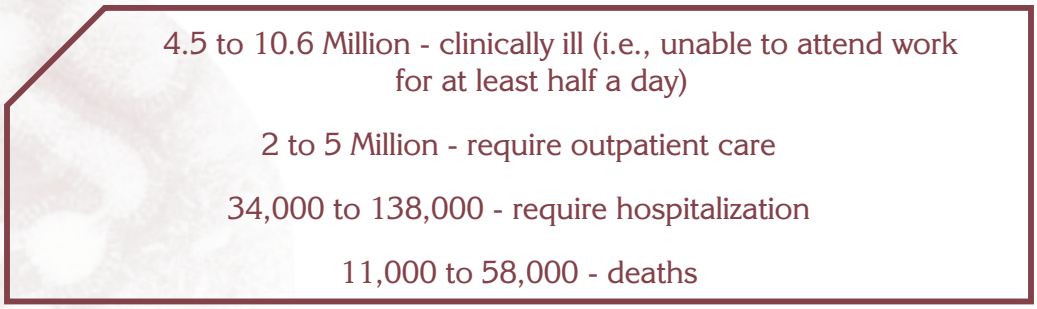
The impact of the next influenza pandemic is difficult to predict, and is dependent on how virulent the virus is, how rapidly it spreads from population to population, and the effectiveness of prevention and response efforts. Despite the uncertainty about the magnitude of the next pandemic, estimates of the health and economic impact remain important to aid public health policy decisions and guide pandemic planning for health and emergency sectors.

During "normal" influenza epidemics which occur almost every winter in North America, an average of 5% to 20% of the population becomes ill, but as high as 30% to 50% of the population may become ill during severe influenza A epidemics. The highest rates of infection and clinical illness occur in children but serious complications and death occur mainly in the elderly. During a pandemic, historic data shows that over 50% of a population may become infected with the novel virus and the age-specific morbidity and mortality may be quite different from the annual epidemics with a higher proportion of deaths in persons under 65 years of age. In 1918–1919 pandemic, young adults had the highest mortality rates, with nearly half of the influenza-related deaths occurring persons 20-40 years of age. During the 1957–1958 and 1968–1969 pandemics in the U.S., persons under 65 years of age accounted for 36% and 48% of influenza-related deaths respectively.

An estimate of the health and economic impact of a pandemic in Canada has been performed using a model developed by Meltzer and colleagues, CDC, Atlanta, (available at http://www.cdc.gov/ncidod/eid/vol5no5/meltzer.htm) with assumptions based on U.S. epidemiologic data on various population health outcomes (death, hospitalization, outpatient treatment, and ill but no formal care) for severe influenza A epidemics, and data from previous pandemics. The model does not include the potential impact of antivirals drugs or an effective vaccine. These estimates may over- or under-estimate the potential impact in Canada; they are being provided for planning purposes only and to raise awareness regarding a very real possibility.

Based on the model an estimated 4.5 to 10.6 million Canadians would become clinically ill such that they would be unable to attend work or other activities for at least a half a day (Figure 1). This proportion, representing 15% to 35% of the population, does not include individuals who contract the virus and feel ill, but continue their usual activities. In addition, it is estimated that between 2.1 and 5.0 million people would require outpatient care, between 34 thousand and 138 thousand people would require hospitalization and between 11 thousand and 58 thousand people would die in Canada during an influenza pandemic (Table 1). These numbers are estimates and do not take into account the differences in the health care systems, practice patterns and health care seeking behaviour in Canada as compared to the U.S., nonetheless, they provide a picture of the magnitude and potential impact of the next influenza pandemic.

Figure 1
Estimated impact of Pandemic Influenza in Canada



Canadian estimates of resource use for patients with these health outcomes and Canadian resource unit costs were applied to provide and estimate of Canadian costs based on this American model. The economic impact (direct and indirect) on the health care system is estimated to be between 10 to 24 billion dollars.

Table 1
Estimated number of cases by outcome

Outcome	Attack Rate 15%			Attack Rate 35%		
	Mean number	5th Percentile	95th Percentile	Mean number	5th Percentile	95th Percentile
Death	17,768	10,544	24,954	41,459	24,603	58,227
Hospitalization	46,639	34,042	59,166	108,824	79,431	138,053
Outpatient Care	2,086,327	2,027,496	2,145,282	4,868,097	4,730,825	5,005,657
Ill, no formal care	2,394,443	2,335,458	2,455,967	5,587,035	5,449,401	5,730,591
TOTAL	4,545,177	4,407,545	4,685,464	10,605,415	10,284,265	10,932,623

2.3 Terminology

2.3.1 Pandemic Phases

The World Health Organization (WHO) pandemic influenza phases (http://www.who.int/emc-documents/influenza/whocdscsredc991c.html) will be used throughout the Plan to assist with the organization of the staged response activities. This common terminology will facilitate communication especially for joint planning and response efforts between Canada, the U.S., and international stakeholders. Once a pandemic has began, different regions of the world may experience different phases at any given time.

For communication purposes the term "Canadian Pandemic Phase" may be used to denote the WHO phase which corresponds to the situation in Canada. Since it is unlikely that the novel influenza strain will first emerge in Canada, it is important to recognize that the declaration of the pandemic in Canada (Phase 1) will most likely occur some time after WHO Phase 1. Once Canada is affected, different communities may move through the phases at different times and rates, however the Canadian Pandemic Phase will continue to refer to the overall national situation.

Table 2 below describes the WHO phases.

For planning purposes, Phase 0 (Preparedness Levels 0 to 3) is considered to be the "interpandemic" period, Phases 1-4 correspond to the "pandemic period" and Phase 5 is the "post-pandemic" period.

Table 2
Pandemic Phases

WHO pandemic phase (and abbreviated description)	Description
WHO Phase 0, Level 0 Inter-Pandemic	› No indications of any novel virus subtype have been reported
WHO Phase 0, Level 1 Novel virus identification in a human	› Novel virus detected in a person › Little or no immunity in the general population › Potential, but not inevitable precursor to a pandemic
WHO Phase 0, Level 2 Human infection confirmed	› Confirmation that the novel virus has infected two or more persons, indicating that the virus is infectious for humans
WHO Phase 0, Level 3 Human-to-Human Transmission Confirmed	› Novel virus demonstrates sustained person-to-person transmission with at least one outbreak over at least a two-week period in one country, or identification of the novel virus in several countries

WHO pandemic phase (and abbreviated description)	Description
WHO Phase 1 Pandemic confirmed	› WHO declaration of pandemic occurs when the novel virus is causing unusually high rates of morbidity and/or mortality in multiple, widespread geographic areas (Note: This is likely to occur in Canada after the WHO declaration of a pandemic but may occur sooner if the novel virus emerges in Canada or is rapidly imported after its emergence outside Canada)
WHO phase 2 Outbreaks in multiple geographic areas	› Further spread of the virus with outbreaks reported in multiple geographic areas, resulting in the first peak of morbidity and mortality
WHO phase 3 End of first wave	› End of first wave when influenza activity has stopped or reversed in initially affected areas
WHO Phase 4 Second or later waves	› Recrudescence of outbreaks caused by the pandemic virus (within three to nine months in past pandemics) following the initial wave of infection; may affect different segments of the population
WHO Phase 5 Post-Pandemic / Recovery	› Return of the seasonal "epidemic" cycle with major disease impact on the elderly and very young

2.3.2 List of Abbreviations

ACPHHS › Advisory Committee on Population Health and Health Security

CCRA › Canadian Customs and Revenue Agency

CDC › Centres for Disease Control and Prevention

CEPR › Centre for Emergency Preparedness and Response

CIDPC › Centre for Infectious Disease Prevention and Control

CMOH › Chief Medical Officer of Health

CPIP › Canadian Pandemic Influenza Plan

CSIS › Canadian Security Intelligence Service

DND › Department of National Defence

EOC › Emergency Operations Centre

ERAP › Emergency Response Action Plan

ERP › Emergency Response Plan

F/P/T › Federal/Provincial/Territorial

HERT › Health Emergency Response Team

JBCRT › Joint Biological Chemical Response Team

JTF2 › Joint Task Force 2

MOH › Medical Officers of Health

NACI › National Advisory Committee on Immunization

NBC › Nuclear, Biological, Chemical

NESS › National Emergency Stockpile System

NML › National Microbial Laboratory

NML4 › National Microbial Laboratory Level 4

OCIPEP › Office of Critical Infrastructure and Protection and Emergency Preparedness

PAHO › Pan American Health Organization

P/T › Provincial/Territorial

QTMH › Quarantine, Travel and Migration Health

RCMP › Royal Canadian Mounted Police

VAER › Vaccine Adverse Events Reporting

WHO › World Health Organization

2.4 Legal Considerations

The legal considerations linked to pandemic preparedness and response are complex, and need to take into account the existing federal legislation as well as legislation in the 13 provinces and territories.

In order to provide an informed and objective examination of these issues, Health Canada commissioned the services of several independent third parties to explore the key issues. One of the deliverables provides an overall legal framework within which the Canadian Pandemic Influenza Plan applies, others looked specifically at 1) patent, contract, tort and insurance issues and 2) labour and employment law issues. The legal considerations identified by the consultants will be considered in the next draft of the Plan.

2.5 Ethical Considerations

As part of the development of the latest version of the Plan, Health Canada, contracted an ethicist to provide "external" advice on some of the problematic ethical and related issues that have emerged as each of the planning components have been examined.

As a result of this process a report was generated that *" attempts to identify relevant ethical principles, rules and values, to develop a reasoned position on some previously articulated and morally problematic measures, and identifies some other moral concerns and questions raised by the planning activities. The report takes the position that the proper initial objective of planning for influenza response is to identify all measures that can diminish as much as possible the impact of the pandemic on our whole population and to assess the benefits and burdens, (including the costs) of these measures*".

The ethical considerations identified by the consultant, such as those surrounding the allocation or prioritization of scarce resources, are continuing to be considered in the next draft of the Plan.