

# **Vulnerability in an Influenza Pandemic: Looking Beyond Medical Risk**

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## Executive Summary

Modern emergency management frameworks include recognition of the need to plan for the needs of the most vulnerable or at-risk people in a community [1-3]. However, identification of people at-risk has been an ongoing issue challenging the emergency management sector for decades, particularly in the context of an influenza pandemic [4-7]. As witnessed during the 2009 H1N1 pandemic and the 2003 SARS outbreak, much attention is directed toward protecting members of the population who are at heightened risk for medical complications from the virus or bacteria. However, it is also important to acknowledge vulnerability through the lens of the social determinants of health, which influence daily resilience and can exacerbate the impacts of a disaster [8-9]. The purpose of this paper is to summarize the literature on how the social determinants of health influence risk during influenza pandemics, with a focus on social vulnerability, rather than risk of medical complications.

The literature reviewed for this paper indicates that in the context of pandemic, there is a *social gradient of risk*, based on social vulnerabilities that are likely to lead to increased exposure to the contagion, risk of basic human needs not being met, insufficient support, or inadequate treatment. With this in mind, the organization of this review of the literature follows most categories within the Social Determinants of Health Framework outlined by Mikkonen and Raphael [10]. The categories of risk have been divided into: a) Income and Income Distribution; b) Social and Physical Environment; c) Education and Literacy; d) Employment and Working Conditions; e) Early Life Income and Child Development; f) Ethnicity, Culture and Language; g) Age and Disability; h) Gender; and i) Access to Health Services.

Income and income distribution are the most salient determinants within the Social Determinants of Health Framework [10], particularly as they intersect with the other determinants to exacerbate risk [6]. Lack of access to financial resources influences exposure, access to supportive care, an individual's social safety net during pandemic, as well as health care seeking behaviour [11-16].

Geographic location, living conditions, and the social context of people's lives all exert influence on susceptibility to risk during pandemic by influencing exposure, ability to meet basic daily needs, and access to supportive care. Social environment can refer to living in crowded housing [17-19], high levels of social interaction [20-21], being reliant on others to assist with daily personal care [22], or lifestyle factors such as injection drug use [23].

People with low literacy levels have been identified by Enarson and Walsh [24] as a high risk population. In the context of pandemic, the ability to understand public health risk communication and act on the recommendation is critical to reducing exposure, monitoring symptoms, and seeking appropriate care. Semenza & Giesecke [25] also identified people with low educational levels as a high risk group that suffers disproportionately from a number of diseases, including respiratory ailments like influenza.

An important category of risk during pandemic is an individual's employment and working conditions. Type of employment, income security, whether an individual has access to benefits

(and hence a social safety net if an employee is sick or needs to stay home to provide caregiving), workplace exposure, demands for essential service workers, and challenges associated with managing multiple role conflicts, all contribute to vulnerability and resilience in pandemic [8, 17, 26-38].

In terms of pandemic planning, very few plans directly address the specific needs of children [39-40], yet they are identified as a high risk population because of functional needs for supervision, transportation, psychosocial supports, and communication, and their inability to live independently [17, 24, 41]. Childrens' immune systems are less developed than those of adults, therefore they are often identified as a population at high risk for severe illness during pandemic or complications from vaccination [42]. However, their psychosocial risks are related to their maturational development and capacity to cope with the social impacts of pandemic or another type of bioevent [43-44].

Risk during pandemic is influenced by ethnicity, culture and language [11, 24, 40, 43, 45-46]. In this review, the general findings related to ethnicity, culture and language as risk factors during pandemic include: a) lower vaccination and health care seeking behaviours among ethnic groups, particularly immigrants; b) lack of knowledge about risk and mistrust of health care professionals influenced attitudes and beliefs toward vaccination and accessing care; c) higher hospital admission rates among Aboriginal populations; d) language and cultural barriers negatively influence reception and comprehension of health information; and d) discrimination and stigmatization toward Asian populations during outbreaks which originated from Asia.

Enarson and Walsh [24] identified the elderly as one of 10 high risk populations in Canada, and there is a growing recognition that the needs of the elderly and people who have disabilities are not addressed adequately in most emergency plans [40]. Loss of autonomy, limited financial resources, reduced mobility and social isolation are all factors which lead to vulnerability in both these populations [16, 25]. For anyone who is reliant on other people for personal care and support for daily living, the socio-economic impacts of a pandemic will present significant challenges in securing appropriate supports.

Gender was an obvious theme through the literature, but rarely identified as such. It is included as a risk factor determining vulnerability for pandemic because of its intersection with all the other social determinants of health and the recognition for the need to consider gender as a cross-cutting theme in pandemic vulnerability [47].

The final category presented to identify people at heightened risk during pandemic is their access to health services. This refers to whether an individual has access to vaccination, treatment for influenza, and health care for other conditions, while a pandemic is occurring. Access to health services is a critical issue during pandemic and requires an ethical framework based on equity [48]. It is understood that health care resources will be depleted within just a few weeks of managing the increased demands for care during pandemic [48], yet the duration of a pandemic is often long, and a second wave, which presents additional demands on an exhausted health care system, is likely [49-50].

The findings from this review suggest a need for more research into the intersection of the social determinants of health in the preparation for, response during, and recovery from a pandemic. Future research should extend the knowledge on each of these determinants to devise solutions to address these risk factors and assist decision makers and service organizations in their attempts to meet the identified needs of the populations impacted negatively by pandemic influenza.

## Introduction

The H1N1 influenza pandemic rekindled attention toward the need for communities and countries to prepare for large scale outbreaks, which have fortunately been few and far between in recent decades. Modern emergency management frameworks include recognition of the need to plan for the needs of the most vulnerable or at-risk people in a community [1-3]. However, identification of people at-risk has been an ongoing issue challenging the emergency management sector for decades [4-5], and there is currently no universal definition that exists to define vulnerable populations [6-7], particularly in the context of an influenza pandemic.

Influenza pandemic planning has proliferated in the past five years and it is well-recognized that preparation for pandemic is unique, compared with other disasters, and must include consideration of the extended duration of the outbreak. The likelihood of disruptions to service and business operations from widespread workplace absenteeism in all sectors is a critical concern and has implications for the provision of essential services and the stability of the economy [35, 49]. While other disasters (eg. hurricanes, floods, earthquakes, explosions) tend to have a sudden impact, such as a large number of casualties or severe damage to physical infrastructure, the impact of a pandemic is realized more gradually, as more people become sick. As the number of infected people increases, the demands on the health care system gradually overload and more socio-economic impacts are realized [48, 51]. As described by Dauphinee [51], a pandemic “requires a more sustained response, as the impact is felt over a much longer period than it would be following an immediate impact mass casualty event” (p. 38).

The risk of disease transmission and the duration of the event are two important differences between pandemic and other types of community disasters. These characteristics influence the type of impacts a pandemic has on the people in a community, particularly those who are more vulnerable. Pandemic planning requires a ‘Whole-Society-Approach’ [2], which extends beyond the medical sphere and considers broader psychosocial and socio-economic impacts on the population.

Potential adverse impacts of pandemic include widespread absenteeism which affects the availability of essential services (eg. water, hydro, food supply, correction services, personal care, supervision, and emergency response). Many people are dependent on these services on a daily basis. Without full capacity for the provision of essential services, supervision for people with cognitive disabilities or people who require monitoring (e.g. those in the criminal justice system) may be limited. In addition, adverse health effects may occur when personal care needs are not met (eg. infections when bandages are not changed or worsening of chronic health conditions if medical home care is disrupted). For people who depend on daily supports from service providers such as the food bank, shelters, or home care, interruptions in essential services for even a day or two can have devastating consequences [52].

As witnessed during the 2003 Severe Acute Respiratory Syndrome (SARS) outbreak and the 2009 H1N1 influenza pandemic, much attention is directed toward protecting members of the population who are at heightened risk for medical complications from the disease. However, it is also important to acknowledge and define segments of the population who are at heightened risk

for vulnerability during an outbreak as a result of the intersection of the social determinants of health [8-9]. These could include people who: experience social disadvantages (such as financial insecurity and the absence of a social safety net); have low literacy levels; are coping with addictions; or have functional limitations which influence their ability to live independently and meet everyday basic needs. The clustering of social vulnerabilities can affect their capacity to mitigate risk by following public health guidelines, as well as their ability to cope with the societal impact of a pandemic [14]. Some communities have made efforts to address this issue by creating specific interagency plans which address the needs of particular subgroups [53]. In light of these issues, the main objective for this paper is to summarize the literature on how the social determinants of health influence risk during influenza pandemics, with a focus on social vulnerability, rather than risk of medical complications.

## Method

This review examines relevant literature from 1918 until 2010, although most of the available literature addressing vulnerability through a psychosocial lens was published during the most recent decade in response to threats such as SARS, H5N1 and H1N1 influenza outbreaks. The following databases were searched for scholarly literature, using keywords and MeSH terms: Medline, PubMed, SCOPUS and CINAHL. Additional online searches of available grey literature were conducted, as well as specific searches of the American Journal of Public Health, numerous journals relating specifically to disaster management, and existing collections at the Public Health Agency of Canada and the University of Ottawa Resilience and High Risk Populations Research Unit.

Following the initial search, inclusion criteria were outlined to determine which articles would be kept in the review. Articles focused on pandemic influenza or large scale outbreaks (eg. SARS) were included in the review, provided they included discussion of vulnerable or marginalized people. Articles about the HIV-AIDS epidemic/pandemic were excluded, unless the discussion was focused on the vulnerability of people with HIV-AIDS in the context of pandemic influenza. All the articles included in the review were published in French or English and provided discussion about populations at risk for vulnerability during pandemic due to their psychosocial risk or marginalization.

The search of the grey literature included websites for Health Canada, the Public Health Agency of Canada, The Canadian Red Cross, Federal Emergency Management Agency (FEMA), and the WHO. Nine provincial and four municipal pandemic plans were also included in the review of the grey literature, as well as the Canadian Pandemic Influenza Plan for the Health Sector, two pandemic planning documents from the WHO, pandemic guidelines from the United Nations, and an Interagency Plan for the Homeless Sector in Ottawa.

The results of the searches produced 147 academic articles and 35 documents from the grey literature, which were examined for relevance and whether they met the inclusion criteria. Each article was reviewed, summarized, and categorized according to the type of social variables discussed and respective vulnerability for pandemic. (eg. income, ethnicity, occupational factors).

## Findings

Upon reviewing the literature, it was clear that vulnerability for an influenza pandemic aligns with the intersection of many of the social determinants of health [10, 54], and should be viewed through an equity lens [3, 14, 16]. The World Health Organization Commission on Social Determinants of Health [54] emphasized the critical influence of structural arrangements and social conditions which lead to inequities. The literature reviewed for this paper indicates that in the context of pandemic, there is a *social gradient of risk*, based on social vulnerabilities that are likely to lead to increased exposure to the contagion, risk of basic human needs not being met, insufficient support, and/or inadequate treatment.

The structure of this paper is based on recommendations in the literature that identification of 'at-risk groups' in the context of an influenza pandemic be based on a model of social justice. Specifically, Usher-Pines et al. [16] suggest there is a need to identify those traditionally disadvantaged, who will likely experience disproportionate impact from a pandemic. With this in mind, the organization of this review of the literature follows most categories within the Social Determinants of Health Framework outlined by Mikkonen and Raphael [10]. The categories of risk have been divided into: a) Income and Income Distribution; b) Social and Physical Environment; c) Education and Literacy; d) Employment and Working Conditions; e) Early Life Income and Child Development; f) Ethnicity, Culture and Language; g) Age and Disability; h) Gender; and i) Access to Health Services.

### Income and Income Distribution

Income and income distribution are the most salient determinants within the Social Determinants of Health Framework [10], particularly as they intersect with the other determinants to exacerbate risk [6]. Lack of access to financial resources influences exposure, access to supportive care, an individual's social safety net during pandemic, as well as health care seeking behaviour [11-16].

Bouye et al. [55] identified public housing residents, lone-parent families, and low income populations as being at increased risk during a pandemic. With limited financial resources and unstable income, people are forced to live in inexpensive, crowded living accommodations, which increase risk of exposure during an outbreak [29, 33, 43, 56-58]. Substandard housing is often associated with inadequate sanitation which can increase exposure and the risk of contracting influenza [7, 59]. An additional source of exposure for people with limited financial resources is crowded public transportation [17].

In the context of the consultations conducted by the International Centre for Infectious Diseases [9] several participants stated that poverty is contributing to pandemic risk for many sub-groups of the population. Lone-parent households and people with functional needs which limit their ability to work or sustain sufficient financial resources are particularly at risk in any situation which threatens their ability to meet basic daily needs for their families, such as shelter, food and clothing [17, 18, 25, 60]. Many people who live 'paycheque to paycheque' will have concern

about missing work to comply with quarantine protocols or provide care for children and other family members, as lost wages may threaten daily survival [7-8, 17, 28, 36, 55, 61]. Likewise many positions are not conducive to flexible work patterns (e.g. working from home, teleconferencing) due to the type of responsibilities and role in the organization [3].

Gaetz [18] suggests federal cuts in spending since 1995 have "... had a profound and disproportionate impact on low-income earning sub-populations, including single parent women, visible minorities and new Canadians" (p.22). The resultant increase in the number of people living in poverty has also forced more people to use food bank support in recent decades. Blickstead and Shapcott [14] suggest differences in socio-economic status and education levels provide the foundation for a "Preparedness Divide" which refers to the gap in preparedness between high and low SES groups, based on differences in the uptake of health promotion information and recommendations. Many jurisdictions recommend people keep enough supplies on hand to look after themselves and their families for 72 hours [62]. For individuals and households living in poverty, preparedness activities, such as stockpiling emergency supplies (eg. food, medication), may be a luxury [52-53, 55]. This is consistent with suggestions from Garoon and Duggan [8] that:

*"in the event of a pandemic, access to cash, food, health care, and other necessary goods and services would be far more difficult for socially and economically disadvantaged groups – not only due to their lower financial resources, but also because of their more tenuous ties to both public and private institutions as well as familial and social networks."* (p.1137)

Vaccination, the most prevalent preventive health intervention for pandemic, can be influenced by income and income distribution; albeit differently depending on the funding structure and system for health service delivery in a given country. Coady et al. [63] and Vlahov et al. [64] examined vaccination uptake among high risk groups and found that being poor was associated with less adherence to vaccine recommendations, particularly among racial and ethnic minorities. This is consistent with the findings of Truman et al. [45] who found immigrants and refugees were at risk because of pre-existing chronic conditions, lack of vaccine coverage, limited access to medical care, and other social factors such as language and housing barriers.

Many individuals who live in countries where there is no universal coverage for vaccines will postpone vaccination due to lack of health insurance coverage [55,65-67]. For migrant workers, lack of documentation is a deterrent for seeking vaccination through publicly-funded vaccination programs [58]. In their study in the U.S., Steege et al. found that many people who lack health insurance will postpone seeking health care treatment until they absolutely have to [58]. Similar situations may arise in Canada for those who lack important health documentation like a valid health card, those that are visiting the country, and immigrants without documentation.

### **Social and Physical Environment**

Geographic location, living conditions, and the social context of people's lives all exert influence on susceptibility to risk during an influenza pandemic by influencing exposure, ability to meet basic daily needs, and access to supportive care. For example, social environment can refer to



living in crowded housing [17-19], high levels of social interaction [20-21], being reliant on others to assist with daily personal care [22], or lifestyle factors such as injection drug use [23]. It can also include the need for assistance from a food bank for daily nourishment [14, 18].

Two ethnicities (Asian and Hispanic) in the US are more likely to live in crowded social environments, regardless of income. Minority groups also tend to use public transportation more regularly, which is another source of crowding, putting them at higher risk of exposure during pandemic [17].

While high levels of social interaction is considered to heighten risk during pandemic, being 'hard-to-reach' is an additional dimension of vulnerability. Hard-to-reach can imply geographic remoteness or social isolation where people live on the outskirts of mainstream society. Ompad et al. [60] identified some examples of hard-to-reach people which included active injection drug users, sex-trade workers, immigrants without documentation, and socially isolated elderly people. Vlahov et al. [64] also identified the same groups, with the addition of 'disenfranchised' groups and people living in poorly-resourced urban communities.

Several provincial pandemic plans acknowledge the need to plan for interagency coordination to ensure continuity of essential services for vulnerable populations including people who are homeless, people who have mental illness, and drug users [68-69]. Homeless or transient populations are at elevated risk during pandemic due to their reliance on crowded shelters, limited financial resources to purchase supplies, and clustering vulnerabilities (such as mental illness and substance addiction) [11, 24, 70-71]. Overcrowded living conditions act as a vehicle for the spread of infection [72], and daily dependence on soup kitchens and food banks and needle-exchange programs are additional social risk factors [23, 53]. The Ontario Pandemic Plan [73] also addresses many of these concerns, with additional discussion about substance dependency and how disruption in substance acquisition could lead to increased crime and demands on law enforcement. At least one jurisdiction has facilitated coordinated planning among interdependent agencies to ensure essential services remain available for people who are homeless, when illness rates and workforce absenteeism are high [53].

Aboriginal populations, particularly those who live in remote communities, are also considered to be at high risk during pandemics. Physical environment, particularly geographic location and inadequate housing, combined with lower socioeconomic status and food insecurity, all interact to exacerbate social risk for many Aboriginal people [74-75]. In some families, additional clustering of risk factors such as limited access to health care, chronic health conditions (eg. Diabetes), substance abuse and violence also contribute to poor health outcomes. People coping with challenging lifestyles often struggle daily to meet survival needs [18, 52], and lack of awareness about health services and preventive health behaviours can manifest into increased exposure and inadequate treatment [63].

The pandemic plan for the province of Quebec [76] addresses the needs of individuals who are socially isolated and not receiving care from friends and family. It proposes the implementation of home support services to check on these individuals and prioritize their admission to a care facility if required. In addition to the high risk groups identified earlier, the pandemic plan for the province of Ontario [73] also emphasizes the vulnerability of people who do not have a primary

care provider. The link with a primary care provider is important as they are regarded as trusted experts and can provide prompts for people to follow vaccination guidelines or preventive health behaviours [77].

The WHO [3] emphasizes the need to provide pandemic guidelines for household caregivers. In an investigation of elderly persons with dementia and their caregivers in the U.S., Thorpe et al., [22] found that older adults were less likely to receive the annual influenza vaccination if their caregiver was experiencing distress or depression, and/or if they had inadequate financial resources. Another study found that the vaccine response of caregivers under stress is often less effective in terms of the development of immunity [78]. The impact of stress on vaccine effectiveness could be extrapolated to other vulnerable groups as well. Geographic location can be a barrier to obtaining preventative health services, especially on an annual basis [22, 79].

Nursing homes and other institutional care facilities provide social and physical environmental contexts which can exacerbate vulnerability during pandemic [4] in addition to the already existing underlying risks of residents (e.g. frailty, underlying medical conditions). They represent close living arrangements, and the residents or patients are particularly vulnerable when absenteeism among facility staff is high, which is expected during pandemic [29]. This vulnerability extends to the issue of whether staff are able to provide adequate care, given reduced human resources, and the stress and burnout experienced by staff when demands are high [32, 80].

The prison population can be at particularly high risk during a pandemic in terms of exposure and access to care [30, 81]. It is important to consider that if an outbreak were to occur, there is a network of social workers and psychologists that interact with the inmates on a regular basis, and confined spaces and restricted movement in prison systems may increase virus transmission during an outbreak, particularly in prisons which are overcrowded. The absenteeism expected during pandemic (approximately ¼ of the workforce) [49] would likely affect the correctional sector as well, reducing the number of guards, parole officers, health care professionals, social workers, psychologists, and other essential workers in the prison system. This effect on human resources will influence inmates, staff and security, as well as people recently discharged from correctional institutions who require community support.

### **Education and Literacy**

The Expert Panel on Health Literacy, created by the Canadian Public Health Association [82], defined literacy as “the ability to understand and use reading, writing, speaking and other forms of communication as ways to participate in society and achieve one’s goals and potential” (p.3). They defined health literacy as “the ability to access, understand, evaluate and communicate information as a way to promote, maintain and improve health in a variety of settings across the life-course” [82] (p.3). People with low literacy levels have been identified by Enarson and Walsh [24] as a high risk population. In the context of pandemic, the ability to understand public health risk communication and act on the recommendation is critical to reducing exposure, monitoring symptoms, and seeking appropriate care. Semenza & Giesecke [25] also identified people with low educational levels as a high risk group that suffers disproportionately from a number of diseases, including respiratory ailments like influenza.

Crighthen et al showed that when people develop complications due to influenza, those with lower educational levels are hospitalized more than the rest of the population [57]. Education is a key strategy to connect high risk populations with programs and services offered in preparation for, response to, and recovery from pandemic [83]. The Government of Canada [49] recommends that, at the first sign of an influenza pandemic, educational material should be made available to the public, including; child care workers; teachers; shelter workers; and correctional workers. Some public health interventions have focused on reducing the preparedness divide by distributing educational information door-to-door to high risk populations known to have lower levels of education and lower socioeconomic status [55]. Communication is only useful if it is culturally and linguistically appropriate, targeted at the appropriate literacy level and provided in the medium being accessed by vulnerable groups.

The WHO [3] highlights the type of interventions to be used before, during and after a pandemic. It is recommended that pandemic preparedness interventions targeting individuals and households focus on education about preventive health behaviours (eg. hand hygiene, social distancing, stockpiling supplies and vaccination), how to monitor symptoms, and when to seek treatment. The capacity to access, understand health information, and apply guidelines to take precautionary measures is an important attribute reducing risk of exposure in pandemic. Limited education, literacy skills, and communication can influence people's knowledge about precautionary measures to reduce exposure, and how to respond (e.g. symptom management and knowing when to seek treatment) [7]. There may also be cultural norms and values around these behaviours and around trust in authority.

In their comparative study of Medicare beneficiaries, Winston et al. [84] found that educational awareness of the vaccine and physician encouragement, were identified as factors that would increase rates of vaccination and reduce the concerns some individuals have concerning side effects. The belief that the vaccine can cause influenza is widespread [77, 84-85], and preventive care education is important in influencing and motivating people to follow vaccination guidelines. Education and income have been found to be positively associated with intention to become vaccinated, due to the increased uptake of health information and recommendations at higher education and income levels [14, 65, 86].

Sub-groups of the Canadian population may have difficulty understanding health information if English/French is not their first language or materials are not provided in an accessible format for people with communication disorders [29]. In a study of migrant farm workers in the US [58], the use of bilingual and bicultural staff called *promotora* helped to bridge cultural gaps and bring farm working families together for health education sessions. In the same study, it was determined that targeting the children of migrant farm workers in education program about emergency preparations could enhance dissemination of pertinent information to the parents. Usher-Pines et al. [16] also note the importance of making sure pandemic plans are tailored to cultural specifications and that they are translated into multiple languages. Stebbins et al. [87] suggest targeted non-pharmacological interventions for children, to enhance preparedness for pandemic and to reduce exposure. Providing educational information about pandemic in a) a variety of languages, b) different formats, and c) multiple levels of complexity (eg. simplifying

information for children) is an important strategy to enhance accessibility of information for high risk populations [29, 88].

Communication of effective health messages is especially important during a pandemic, and providing empirical facts alone is not effective in fostering compliance to public health recommendations [7]. Reasoning and adoption of recommended preventive behaviours are impacted by health beliefs and attitudes, which in turn are influenced by education and culture [87, 89-94]. This finding supports the need to recognize how different cultural and demographic groups interpret messages, and how this may contribute to their attitudes and potential vulnerability during pandemic [65, 89, 94-95].

### **Employment and Working Conditions**

An important category of risk during pandemic is an individual's employment and working conditions. The type of employment, income security, access to health benefits (and hence a social safety net if an employee is sick or needs to stay home to provide caregiving), workplace exposure to the virus, workplace demands, and challenges associated with managing multiple role conflicts, all contribute to vulnerability and resilience in pandemic [8, 17, 26-38].

Essential service workers, in particular first responders (eg. EMS) and front line health care workers, are more widely recognized to be at increased risk during an influenza pandemic, particularly after the experience of the global outbreak of SARS in 2003 and concern about H5N1 (Avian Influenza) and H1N1 and their potential to become pandemic [36, 43, 80, 96-98]. In a recent publication from the WHO [2] there is an emphasis on the need and obligation of government and health care organizations to protect the health care workforce. In Canada, in response to the devastating effects of the SARS outbreak on health care workers, the federal government updated the Canadian Pandemic Influenza Plan and identified that it was specifically for the Health Care Sector. An accompanying psychosocial annex was developed to highlight some of the challenges and vulnerabilities for the health care sector [49, 59].

The Public Health Agency of Canada [49] estimates that in the peak two week period during pandemic of influenza, 20 to 25 percent of the population may be absent from work. Essential service workers, particularly those in health care settings or response organizations (eg. Paramedics) are particularly at risk for burnout, psychosocial stress, and exposure to the contagion [35-36, 96-98]. This psychological stress was observed during the SARS outbreak in 2003 [59, 80] and during the aftermath of Hurricane Juan [36] and Hurricane Katrina [32].

The H1N1 pandemic, which was mild compared to other strains of pandemic influenza, resulted in 9% absenteeism in November 2009, based on data from the Labour Force Survey [99]. The number of women who missed work as a result of their own flu-like symptoms or those of their family members was higher than men (10.5% and 7.6%, respectively), although there was no difference in the average number of hours of missed work [99]. Health care workers put in more than 2.0 million additional work hours during the month of November in 2009, in response to the H1N1 pandemic [99].

One population that is especially at risk during pandemic in both the U.S. and Canada is migrant farmworkers. Steege et al. [58] describe how farmworkers are at risk because of their interactions with animals that may harbour the virus, as well as their non-citizen status and the social conditions under which they work and live. As many as 4.2 million seasonal and migrant workers are employed in the agricultural industry in the U.S. [58]. In Canada there are 18,000 to 20,000 migrant workers who live and work in precarious situations [100]. Furthermore, economic factors and substandard living conditions can exacerbate the situation. In an examination of 37 national pandemic plans, Garoon & Duggan [8] noted that needs of migrant workers and immigrants were addressed in only two. Historical studies have also shown that harsh and crowded working environments, such as coal mining, can also facilitate the spread of influenza [101], as well as occupations which include close contact with the public, such as the food and service industries and the sex-trade [9].

Additional concerns related to employment and working conditions include compliance with imposed quarantine measures and social distancing recommendations, which may result in lost income and job insecurity [17, 28]. Some people cannot afford to stay home and sacrifice their income. Others work in essential service positions and are required to ensure continuity of services for the community. Child care issues may be an additional challenge whereby parents may be forced to bring their children to group day care settings when they are sick or have been exposed to influenza [36]. Alternatively the parents may be forced to sacrifice income in order to stay home to care for sick children. Job security, flexible work arrangements, and income replacement strategies are recommended by government to reduce differential impacts of quarantine restrictions on disadvantaged populations when quarantine is in effect, however these interventions are not feasible for all employment positions. The following quotation from Baum et al. [28] is an important statement highlighting the need for policy makers to recognize vulnerabilities that can arise from the implementation of public health interventions during a pandemic:

*Policy makers will need to ensure that vulnerable populations or other sub-populations do not shoulder unfair burdens or receive fewer benefits during a pandemic due to the implementation of social distancing measures. The financial struggles that many will face as a result of mandatory school or business closure during a pandemic, for instance, will be most pronounced for low-income workers and the least well-off in society. These groups will have fewer financial resources to sustain them during business or school closures, and may be at higher risk of job loss if they lack vacation or sick leave benefits. (p.11)*

### **Early Life Income and Child Development**

In terms of influenza pandemic planning, very few plans directly address the specific needs of children [39-40], yet they are identified as a high risk population because of functional needs for supervision, transportation, psychosocial supports, and communication, and their inability to live independently [17, 24, 41]. Children's immune systems are less developed than those of adults, therefore they are often identified as a population at high risk for severe illness during pandemic or complications from vaccination [42]. However, their psychosocial risks are related to their

maturational development and capacity to cope with the social impacts of pandemic or another type of bioevent [43-44].

Of the pandemic plans reviewed, many addressed the need for paediatric planning during a pandemic, but few explain how this should be done. Children spend much of their time in groups; in school, day care, or group activities. This underscores the need to a) plan non-pharmaceutical interventions to protect them from exposure when social distancing is unlikely [87], and b) reduce the likelihood of infection through vaccination, which can be conveniently provided in schools [102].

There are numerous reasons why children are at risk during pandemic influenza [103], however, particular determinants of risk for children include their reliance on others for food, shelter, transport, and other basic requirements [42]. In households with lower levels of income, children are especially vulnerable to the socio-economic impacts of pandemic when they lack resources to prepare (eg. inability for families to stockpile food, medications, and household supplies) [16]. Homelessness is discussed in another section of the paper focused on social and physical environments, but it is important to acknowledge the specific risks for children who live with housing insecurity, such as those children who are living in shelters for survivors of domestic violence. The psychosocial impacts of pandemic influenza can present tremendous stressors for children who may not have developed skills to cope with the distress [43]. "Homeless children are much more likely to experience physical, mental, emotional, educational, developmental, and behavioural problems, and they are less likely to have obtained preventive health care services, such as routine immunizations, compared to children who are not homeless" [11] (p.504).

If school and daycare closures are implemented as a pandemic response intervention to reduce transmission in a community, many families face significant challenges ensuring their children are supervised. For some sectors (e.g. health care), this is particularly concerning as the majority of workers are female and assume responsibility for child care [36]. Children whose parents cannot afford missed income, to comply with quarantine measures, or to fulfill their caregiving duties may be at heightened risk of exposure to the contagion being in group care facilities [17]. Older siblings expected to provide care for younger siblings while the parents continue to work may also be placed at increased risk. Lack of supervision is another risk for children when parents must attend work but have no childcare support [28]. Participants in focus groups conducted by Baum et al. [28] "feared that economic pressures to go to work would lead to unsafe situations, such as children left home unattended, or would further spread disease by unsupervised teenagers intent on socializing despite school or business closures" (p.6).

Education and literacy are also factors which influence a parent's ability to reduce exposure and ensure appropriate care for children during pandemic [91]. Children are reliant on parents and guardians for psychological support and decision-making, such as getting vaccinated or seeking treatment for symptoms [13, 86, 103]. In a survey study administered to a number of health professionals concerning vaccinations among children, education and communication for parents was listed at one of the needs recognized by health professionals [39].

### *Ethnicity, Culture and Language*

Risk during pandemic is influenced by ethnicity, culture and language [11, 24, 40, 43, 45-46]. The literature reviewed suggests vaccination rates are lower among ethnic minorities. It also suggests access to appropriate and quality care and health care seeking behaviours are influenced by language, cultural beliefs, attitudes, and socio-economic barriers. In this review, the general findings related to ethnicity, culture and language as risk factors during pandemic include: a) lower vaccination and health care seeking behaviours among ethnic groups, particularly immigrants; b) lack of knowledge about risk and mistrust of health care professionals influenced attitudes and beliefs toward vaccination and accessing care; c) higher hospital admission rates among Aboriginal populations; d) language and cultural barriers negatively influence reception and comprehension of health information; and d) discrimination and stigmatization toward Asian populations during outbreaks which originated from Asia.

Enarson & Walsh [24] identified new immigrants and cultural minorities among Canada's 10 high risk populations during a natural disaster. Recent immigration status has also been identified as a risk factor that could lead to increased rates of influenza among newcomers in Europe [25]. In an examination of 37 pandemic plans, the needs of migrant workers and immigrants were only addressed in two [8]. This is a concern in the U.S. and echoed in Canada given that the number of both documented and non-documented immigrants has been steadily increasing [11, 100].

Immigrants may not have received preventative health measures such as childhood vaccinations for many infectious diseases, and they often lack access to health services in the new country. Socially marginalized groups may also face barriers to accessing health information via the internet or the telephone if these items are not available or present in the home [49]. However, in the aftermath of Hurricane Katrina, emergency planners have begun to realize the importance of including racially and ethnically diverse communities in the planning phases of preparedness plans [104].

Data from the Canadian Community Health Survey shows vaccination rates for H1N1 in 2009 were lower among immigrants in Canada [105]. Rates of vaccination, for seasonal influenza and other infectious diseases, among different ethnic groups have been studied extensively in the United States. The U.S. studies focused mainly on vaccination uptake rates between African-Americans, Whites and Hispanics [66-67, 77, 84-85, 88, 106-109], as well as Vietnamese and other Asian minorities [110], and comparisons between multiple ethnic groups [65]. Lower vaccination rates among African Americans and other ethnic minorities, compared with White ethnic groups, is a consistent finding in the literature from the U.S. [77, 88, 95, 107, 111-112].

Attitudes and beliefs toward pandemic, lack of access to care, mistrust of health care professionals and health authorities, and lack of knowledge have all been found to contribute to lower vaccination rates among ethnic minorities [61, 113]. In a study conducted in the U.S. which focused on African Americans, Asians, Native Hawaiians, other Pacific Islander, and Latino populations, Hutchins et al. [92] cite "socioeconomic disadvantages; cultural, educational, and linguistic barriers; and lack of access to and use of health care" (p. 261) as factors that increase vulnerability during a pandemic. In a study examining vaccination rates in older adults, Fiscella et al. [66] found significant racial and ethnic barriers and disparities that contribute to

poor uptake on vaccines and mortality among elderly minority groups. The observation that African Americans chose to get vaccinated less than other ethnic and cultural groups prompted Cameron et al. [89] to conduct focus groups to determine the underlying reasons for discrepancies in vaccination rates. Convenience of vaccination clinics emerged as an important determinant of vaccine uptake for African Americans.

Sengupta et al. [114] conducted a qualitative study to determine which barriers and facilitators influenced African-American older adults to get vaccinated for influenza. Structural factors, such as lack of insurance and limited access to physicians for information were barriers, as well as social influences (eg. being discouraged from getting the vaccine by people in their social networks). They identified several structural and personal factors facilitated vaccine uptake, including reminders from health professionals, insurance coverage, being knowledgeable about influenza, taking into account their own health conditions, their age, and believing the immunization would prevent the community from getting sick. These findings are consistent with Schwartz et al. [106] who found that interventions involving health communication at the time of the doctor's appointment were effective in increasing vaccine among older adults who are members of ethnic minority groups. Furthermore, Sambamoorthi & Findley [115] reported that health literacy, fear of the healthcare system or the vaccine, and convenience of clinics were all important determinants of whether ethnic populations were vaccinated.

Studies examining infection, mortality rates, vaccinations and hospital admissions among Aboriginal populations, in the context of pandemic, have been conducted in the U.S. [75], Canada [116] and other countries such as New Zealand [117] and Australia [74, 118-121]. The literature consistently shows risk of contracting influenza and hospital admissions are higher for Aboriginal populations, partially due to co-morbidity (eg. diabetes), however social context such as poverty, homelessness, living in remote communities, and delays in accessing or seeking health care also contribute to vulnerability in pandemic for Aboriginal populations [74-75, 120, 122]. McIntyre and Menzies [120] also identified urban dwelling Aboriginal populations as being particularly at risk, because their indigenous status often goes un-recognized, which highlights the importance of targeted vaccination programs for Indigenous groups living in urban centres.

In a Canadian study based in Manitoba, which examined H1N1 hospital admissions, Aboriginal populations were over-represented; a common trend observed in previous outbreaks of influenza [116]. Flint et al. [122] conducted a study examining hospital admissions among Indigenous populations in Australia and also found that despite their relatively small population, they made up 16% percent of all hospital H1N1 admissions during the 2009 outbreak. Similar findings were reported in studies examining American Indian populations in the United States [75, 79, 123].

Language and culture are intricately linked to ethnicity, and influence people's ability to receive and understand public health information, as well as their access to appropriate and quality health services. In Canada, Aboriginal populations are overrepresented in the homeless population by a factor of 10 [71]. This can have significant implications for this group receiving the necessary treatment if they were ever to develop influenza. There is also substantial differences among Aboriginal groups themselves. In an American study, a panel of experts was consulted and expressed that solutions should be tailored to meet the specific sizes of the Native



American tribes because they may have different needs based on their compositions [124]. This same group of experts also expressed the need for more funding to be directed toward preventative measures, and noted that public health programs were often missing for these populations.

Another factor which contributes to the classification of racial and ethnic minorities as high risk populations is discrimination and stigma. This is evidenced by the experiences of Asian Canadians and immigrants during the 2003 outbreak of Severe Acute Respiratory Syndrome (SARS) [125]. The SARS outbreak originated in China and spread globally in a matter of weeks. Discrimination toward Asian, and particularly Chinese, people in Canada was experienced at multiple levels, from direct comments in schools, at workplaces, health care facilities, and public transit, to distasteful cartoons in the newspaper. Businesses in the Chinatown districts of several cities experienced dangerously low patronage, forcing financial hardship on many families.

Some groups isolate themselves from society for cultural and religious reasons (eg. Amish communities). These populations often have lower vaccination rates, which can contribute to vulnerability in pandemic [126]. Religious gatherings can also heighten the risk of disease transmission. Shafi et al. [21] discussed the risk associated with the Hajj pilgrimage to Mecca, which more than 2 million Muslims attend every year. Transmission of influenza during mass gatherings is a particular concern for public health officials.

Belmaker et al. [13] highlighted the pandemic risk associated with semi-nomadic populations, in particular the Bedouin Arabs in Israel, who have similar living / social environments (overcrowded common living spaces, high unemployment, large families) to people in developing countries, but they live in the outskirts of urban areas in a developed society, in this case, Israel. The members of this ethnic community usually don't have health insurance, but in 1995 Israel instituted universal health coverage which provided all Bedouin Arabs access to primary care. This was deemed to be an important factor in the increase in rates of immunization for communicable diseases such as measles. The concepts from this study could be explored with other semi-nomadic cultural groups, refugees and immigrants.

### **Age and Disability**

The last few categories of determinants which influence vulnerability and risk for pandemic overlap with many of the issues presented in earlier sections. This is indicative of the interaction between the social determinants of health [10]. Age and disability are presented together as determinants of risk for pandemic because they are clustered as variables in the literature for many studies, presumably because the prevalence of disability increases with age. In Canada, in 2001, approximately 3.6 million Canadians self-identified as having a disability, based on the questions posed in the Participation Limitation and Activity Survey (PALS) [127].

Enarson and Walsh [24] identified the elderly as one of 10 high risk populations in Canada, and there is a growing recognition that the needs of the elderly and people who have disabilities are not addressed adequately in most emergency plans [40]. Loss of autonomy, limited financial resources, reduced mobility and social isolation are all factors which lead to vulnerability in both these populations [16, 25]. For anyone who is reliant on other people for personal care and

support for daily living, the socio-economic impacts of a pandemic will present significant challenges in securing appropriate supports.

People with disabilities who are reliant on the help of others to perform personal care activities are also at risk during pandemics for a number of reasons [29]. The caregivers of such individuals are often not recognized as essential health care workers and therefore do not receive early doses of the vaccine. The Canadian Pandemic Influenza Plan [59] emphasizes the importance of including people who have different types of disabilities or functional limitations in the pandemic planning process, to ensure plans are inclusive and comprehensive. It should be noted that “disability is not limited to wheelchair users and people who are blind or deaf. Individuals with disabilities include those with one or more activity limitations such as a reduced or inability to see, walk, speak, hear, learn, remember, manipulate or reach controls, and/or respond quickly” [41]. Pandemic plans also often overlook the needs of people with disabilities and emergency communication is rarely accessible for people with vision and/or hearing impairments [29]. People who have communication disorders may also have difficulty responding to warnings, obtaining information, or communicating their needs [59]. Specific conditions which may present functional limitations for communication include, but are not limited to, aphasia, dementia, and stroke, as well as sensory disabilities impacting vision and hearing.

The province of Quebec [76] lists “...elderly people, young people with difficulties and their families or those with pervasive developmental disorders, people who are functionally dependent, people with physical or intellectual disabilities, and people with mental health problems or addictions” as particularly vulnerable during pandemic (p.77). Chen et al. [128] suggest that people with traits that differ from the average person and those who may have difficulty obtaining required services may be vulnerable during emergency scenarios, such as pandemic, and they specifically identify the elderly age cohort as a group at heightened risk.

The elderly are also at a higher risk of influenza due to biological factors. Due to decreased immune system activity, the elderly are at an increased risk of respiratory infections, especially if they live in assisted living facilities [93]. The vulnerability of nursing home residents has been a concern for some time and many studies describe the beneficial effects vaccination can have for this population [129]. The elderly are more vulnerable to secondary bronchial infections like pneumonia, and may also require additional booster vaccinations to ensure their immune systems are properly functioning with the vaccine. In addition to this, if the elderly were to contract influenza, they may be ill for a longer period of time and therefore transmit the virus at a higher rate than the rest of the population [130]. Previous research has shown racial and ethnic disparities in vaccination rates among the elderly [66, 77, 108, 112]. Fiscella et al. [66] asked people over age 65 years if they had been vaccinated against influenza in the previous year, and rates of vaccination among the entire sample were much lower than expected.

A common theme in the literature surrounding vaccination of older populations is that being reminded by a health care practitioner is an effective facilitator for vaccination uptake [77, 112], even in the form of a postcard or a reminder in the mail [114]. Dushoff et al. [131] explain that children are often vectors for transmitting influenza to the elderly and it may be beneficial to vaccinate younger age groups as a strategy to reduce transmission to the elderly.

In a study of older adults with dementia, caregiver distress and depression were found to exert a negative influence on annual vaccination rates [22]. Sambamoorthi and Findley [115] cited health literacy among the elderly as a contributing influence to low vaccination uptake, in addition to racial, financial and convenience barriers. Dementia and other cognitive impairments may also make it difficult to understand important emergency communications during the pandemic [15, 43]. Those with pre-existing psychological disorders may also experience augmentation of symptoms due to the stress of a pandemic [59]. Geographic location of the immunization clinic was also deemed to be a barrier to obtaining the vaccine. Finally, elderly caregivers may not have the opportunity to seek out vaccinations, particularly if this involves travelling and long wait times.

### **Gender**

Gender was an obvious theme through the literature, but rarely identified as such. It is included as a risk factor determining vulnerability for pandemic because of its intersection with all the other social determinants of health and the recognition for the need to consider gender as a cross-cutting theme in pandemic vulnerability. A full sex and gender-based analysis of vulnerability during pandemic is beyond the scope of this paper, however, we feel it is important to identify several issues which emerged from the literature review which could be explored further for more indepth understanding of the role of gender in both resilience and vulnerability for pandemic influenza.

Enarson [47] highlights the importance of mainstreaming gender analysis in any discussion of vulnerability or disaster preparedness, response or recovery due to its role in determining women's power in society, her access to resources, her risk of exposure and her access to appropriate care and treatment. Gender intersects with the other social determinants of health, and is particularly intertwined with income and income security, social and physical environments, employment and working conditions, early life income and child development, age and disability, and access to health services.

Income and income security is a prominent gender issue, particularly with regards to lone-parent households and child rearing. Many women work part time and have fewer financial reserves to cope with the socio-economic impact of pandemic. Caregiving, both at home and in the health sector is provided predominantly by women [132]. Higher social interactions, particularly when personal care is provided means women will have increased exposure to the contagion. They may be unable to comply with quarantine protocols and social distancing measures, and may need to miss work because of illness or to fulfill their caregiving responsibilities, which has financial implications due to lost income or job insecurity.

### **Access to Health Services**

The final category presented to identify people at heightened risk during pandemic is access to health services. This refers to whether an individual has access to vaccination or treatment for influenza or other health issues during an influenza pandemic. Access to health services is a critical issue during pandemic and requires an ethical framework based on equity [48]. It is

predicted that health care resources may be depleted within just a few weeks of managing the increased demands for care during an influenza pandemic [48]. Since the duration of a pandemic is often long and a second wave, which presents additional demands on an already exhausted health care system, is likely [49-50], the impacts on the health care system could be significant.

Vaccination and treatment-seeking behaviour are important factors determining risk during an influenza pandemic, particularly for people who have chronic medical conditions who may require ongoing access to health professionals [14, 83]. It was estimated by Statistics Canada that during the H1N1 pandemic, 41% of Canadians over age 12 received the pandemic vaccine. This estimate excludes vaccination given to military personnel and Aboriginal Peoples living on reserves, who receive health services directly from the federal government [105]. In the survey, the main reasons people provided to explain why they hadn't been vaccinated were a) their belief it was not necessary and b) their perception that the media had exaggerated the threat. Vaccine uptake rates among health care professionals were higher in Canada than other countries; 66% of health care workers in Canada received the vaccination. The U.S. reported 37% of health care workers had been vaccinated [105].

In Canada, during the H1N1 pandemic, immigrants and refugees were less likely to be vaccinated (38%) [105]. As discussed in a previous section on culture, ethnicity and language, vaccination uptake rates are influenced by many factors, including limited access to transportation, geographic location, health beliefs, and possession of health insurance and legal documentation, and language barriers [11, 17, 22, 58, 106, 117]. Income and income security intersect with all of these factors, particularly in relation to health insurance, availability of health professionals, and convenience for accessing services [7, 13, 17, 72].

Access to transportation is an important factor influencing people's ability to seek treatment or preventive health services, therefore Santibanez et al. [46] included those who are "transportation disadvantaged" to be part of a high risk group. Hebert et al. [85] found that people were more likely to receive a vaccine if it was being given in a location that was accessible for them. Certain marginalized groups, particularly low income residents in city centers, and Aboriginal populations in rural and remote communities have difficulty in accessing health services and education programs [11, 18, 72]. To address this issue, Coady et al. [63] conducted an intervention study which involved dissemination of educational information to hard-to-reach groups, employing door-to-door canvassing as a strategy to reach the community. This strategy improved accessibility by reaching populations not typically influenced by other communication campaigns. Vlahov et al. [64] concluded that interventions which utilized door-to-door strategies were more successful in targeting hard-to-reach populations, if planned in advance.

Many people who have limited financial resources and certain ethnic groups (non-Hispanic black and Hispanic) do not have a regular primary health care provider. Therefore, they are more likely to delay seeking treatment and to seek primary care through emergency departments in hospitals, which affects the timeliness of their treatment. Given the potential delays in being assessed, effective treatment with antivirals during an influenza pandemic may be impacted as they are designed for early treatment [17]. Crighton et al. [57] also observed that in Ontario, there was an overrepresentation of influenza and pneumonia hospitalizations in the elderly, Aboriginals, and those with lower levels of education.

Certain groups who are already reliant on the health care system may be at an increased risk if the system became stressed due to an influenza pandemic. Individuals with conditions such as HIV/AIDS, hepatitis A and B, and tuberculosis may not be able to receive the sufficient and appropriate care they need if all of the health care providers are managing a pandemic. With immune systems that are already weaker than usual, these patients are especially susceptible and reliant on access to services during a pandemic [83].

Health care seeking behaviour can be negatively affected by language and cultural barriers for ethnic and cultural minorities. For health care information to be accessible and effective, cultural sensitivity is needed; including the need for translation [88]. The quality of treatment and understanding of risks can be negatively impacted by these social barriers. For people who lack health insurance or do not have citizenship documents, paying for health care services can be a problem and often influences when or if they seek treatment.

## Recommendations and Concluding Remarks

Based on the available evidence in the existing literature, vulnerability during an influenza pandemic is closely aligned with risk factors identified as the social determinants of health [10, 16]. In the 'Whole-of-Society Approach to Pandemic Planning' recommended by the WHO [2], there is an emphasis on the vulnerability of service organizations and businesses who have critical interdependencies (eg. health care facilities which are dependent on electricity, water, telecommunications, and pharmaceutical and other supply distribution through the transportation sectors). These interdependencies in modern society create complex vulnerabilities for essential services workforces and have an influence on who becomes most vulnerable to societal impacts of a pandemic.

This review of the literature has highlighted numerous areas for future research, the most prominent being the need to examine the influence each social determinant, and particularly gender, on risk and vulnerability in the context of pandemic. Women play an important role in providing care, educating, and seeking treatment for family members. Their significance in pandemic preparedness, response and recovery needs to be explored further.

While it is important to ensure identification of high risk populations for pandemic, it is equally important to identify needed supports which can mitigate social risk and minimize the impact of pandemic on populations which are typically disadvantaged in everyday life. Addressing the social determinants of health and changing the paradigm for pandemic preparedness is a necessary step. Future research studies should examine alternate paradigms for combining efforts to enhance daily resilience and preparedness for pandemic and other types of disasters.

An additional consideration is that vulnerability and risk vary according to the type of intervention implemented at different stages of crisis management (readiness, response and recovery). Interventions aimed at promoting preventive health behaviours to avoid exposure and transmission must consider an individual's ability receive, interpret and apply health recommendations, according to their functional capacity and social context.

The findings from this review suggest a need for more research into the intersection of the social determinants of health in the preparation for, response during, and recovery from a pandemic. Future research should extend the knowledge on each of these determinants to devise solutions to address these risk factors and assist decision makers and service organizations in their attempts to meet the identified needs of the populations impacted negatively by pandemic influenza. The terms used to describe high risk groups are important, particularly in terms of framing vulnerability. Most people prefer not to be labelled 'vulnerable' and part of promoting resiliency is providing empowerment. Being at risk does not necessarily imply vulnerability, if appropriate supports are available.

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# **Appendix**

**Suggested Readings**  
**Glossary of Common Terms**

## Suggested Readings

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## Glossary of Common Terms

**All hazards approach:**

“An emergency system or plan that focuses on common consequences, which can be used during any emergency or disaster. (p. 31)” (British Columbia Pandemic Plan, 2005).

**Antigen:**

“Any molecule that is recognized by the immune system and that triggers an immune response, such as release of antibodies. (p. 543)” (PHAC Canadian Pandemic Influenza Plan, 2006).

**Coping capacity:**

“The means by which people or organizations use available resources and abilities to face adverse consequences that could lead to a disaster. In general, this involves managing resources, both in normal times as well as during crises or adverse conditions. The strengthening of coping capacities usually builds resilience to withstand the effects of natural and human-induced hazards. (p.7)” (Enarson & Walsh, 2007).

**Emergency management:**

“The management of emergencies concerning all hazards, including all activities and risk management measures related to prevention and mitigation, preparedness, response and recovery. (p.7)” (Enarson & Walsh, 2007).

**Emergency management organizations:**

“Designated organizations operating in different sectors at the federal, provincial and territorial levels, including Aboriginal organizations with emergency management responsibilities. (p.7)” (Enarson & Walsh, 2007).

**Epidemic:**

“An outbreak of infection that spreads rapidly and affects many individuals in a given area or population at the same time. (p. 544)” (PHAC Canadian Pandemic Influenza Plan, 2006).

**H1N1:**

A strain of influenza which was responsible for the 2009 swine-flu epidemic. It also caused the influenza pandemic of 1918-1919.

**High-risk groups:**

“Those groups in which epidemiological evidence indicates there is an increased risk of contracting a disease. (p.545)” (PHAC Canadian Pandemic Influenza Plan, 2006).

**High-risk populations:**

“People whose situational and physical characteristics increase their susceptibility to harm due to disasters. (p.7)” (Enarson & Walsh, 2007).

**Influenza:**

“A highly contagious, febrile, acute respiratory infection of the nose, throat, bronchial tubes, and lungs caused by the influenza virus. It is responsible for severe and potentially fatal clinical illness of epidemic and pandemic proportions. (p.545)” PHAC Canadian Pandemic Influenza Plan, 2006).

**Influenza-Like Illness (ILI):**

“Acute onset of respiratory illness with fever and cough and one or more of sore throat, arthralgia, myalgia or prostration which could be due to influenza. (p. 44)” (British Columbia Pandemic Plan, 2005).

**Morbidity:**

“Departure from a state of well-being either physiological or psychological; illness. (p.546)” PHAC Canadian Pandemic Influenza Plan, 2006).

**Outbreak:**

“An increase in disease activity above expected levels. Also known as an epidemic. The latter term has more serious connotations. (p.48)” (British Columbia Pandemic Plan, 2005).

**Pandemic:**

“Referring to an epidemic disease of widespread prevalence around the globe. (p.547)” PHAC Canadian Pandemic Influenza Plan, 2006).

**Preparedness:**

“The knowledge and capacities developed by governments, professional response and recovery organizations, communities and individuals to effectively anticipate, respond to, and recover from, the impacts of likely, imminent or current hazard events or conditions. (p. 9)” (UNISDR Terminology on Disaster Risk Reduction, 2008).

**Primary Care:**

“The first level of care, and usually the first point of contact, that people have with the health care system. Primary care involves the provision of integrated, accessible health care services by clinicians who are responsible for addressing a large majority of personal health care needs, developing a sustained partnership with patients, and practicing in the context of family and community. It includes advice on health promotion and disease prevention, assessments of one's health, diagnosis and treatment of episodic and chronic conditions, and supportive and rehabilitative care. (p.49)” (British Columbia Pandemic Plan, 2006).

**Resilience:**

“The capacity of a system, community or society to adapt to disturbances resulting from hazards by persevering, recuperating or changing to reach and maintain an acceptable level of functioning. (p.7)” (Enarson & Walsh, 2007).

**Social vulnerability:**

“Refers to vulnerabilities at the level of population groups in a particular cultural, historical, political and social context. Experienced at the individual level but determined by relative group

access to key resources and the capacities and resources of the subpopulation. (p.7)" (Enarson & Walsh, 2007).

**Vaccine:**

"A substance that contains antigenic components from an infectious organism. By stimulating an immune response (but not disease), it protects against subsequent infection by that organism. (p. 550)" (PHAC Canadian Pandemic Influenza Plan, 2006).

**Vulnerability:**

"The propensity to suffer some degree of loss (e.g., injury, death, damages) from a hazardous event. Whether considering a community, an individual, an economy or a structure, vulnerability depends upon coping capacity relative to the hazard's impact. (p.7)" (Enarson & Walsh, 2007).

**Virus:**

"A group of infectious agents characterized by their inability to reproduce outside of a living host cell. Viruses may subvert the host cells' normal functions causing the cells to behave in a manner determined by the virus. (p. 550)" (PHAC Canadian Pandemic Influenza Plan, 2006).

*For additional pandemic information and a list of common terms, please refer to the PHAC Canadian Influenza Pandemic Plan (2006) and the associated Psychosocial Annex (2009).*