The 2009 H1N1 Health Sector Pandemic Response in Remote and Isolated First Nation Communities of Sub-Arctic Ontario, Canada

by

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AUTHOR'S DECLARATION

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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ABSTRACT

On June 11, 2009, the World Health Organization declared a global influenza pandemic due to a novel influenza A virus subtype of H1N1. Public health emergencies, such as an influenza pandemic, can potentially impact disadvantaged populations disproportionately due to underlying social factors. Canada's First Nation population was severely impacted by the 2009 H1N1 influenza pandemic. Most First Nation communities suffer from poor living conditions, impoverished lifestyles, lack of access to adequate health care, and uncoordinated health care delivery. Also, there are vulnerable populations who suffer from co-morbidities who are at a greater risk of falling ill. Moreover, First Nation communities that are geographically remote (nearest service center with year-round road access is located over 350 kilometers away) and isolated (only accessible by planes year-round) face additional challenges. For example, transportation of supplies and resources may be limited, especially during extreme weather conditions. Therefore, remote and isolated First Nation communities face unique challenges which must be addressed by policy planners in order to mitigate the injustice that may occur during a public health emergency.

The Assembly of First Nations noted that there has been very little inclusion of First Nations' input into current federal and provincial pandemic plans. Disadvantaged groups know best how they will be affected by a public health emergency and are able to identify barriers and solutions. Therefore, the objective of my research was to gain retrospective insight into the barriers faced by three remote and isolated First Nation communities of sub-arctic Ontario (i.e., Fort Albany, Attawapiskat, and Kashechewan) during their 2009 H1N1 pandemic response. Culturally-appropriate community-based suggestions for improvement of existing community-level pandemic plans were also elicited. Collected data informed modifications to community-level pandemic plans, thereby directly applying research findings.

Being a qualitative community-based participatory study, First Nation community members were involved in many aspects of this research. Semi-directed interviews were conducted with adult key informants (n=13) using purposive sampling of participants representing the three main sectors responsible for health care services (i.e., federal health centers, provincial hospitals, and Band Councils). Data were manually transcribed and coded using deductive and inductive thematic analysis to reveal similarities and differences experienced within and between each

community (and government body) regarding their respective pandemic response. Another round of semi-directed interviews (n=4) and community pandemic committee meetings were conducted to collect additional information to guide the modifications to the community-level pandemic plans.

Reported barriers due to being geographically remote and isolated included the following: overcrowding in houses, insufficient human resources, and inadequate community awareness. Primary barriers faced by government bodies responsible for health care delivery were reported as follows: receiving contradicting governmental guidelines and direction from many sources, lack of health information sharing, and insufficient details in community-level pandemic plans. Suggested areas for improvement included increasing human resources (i.e., nurses and trained health care professionals), funding for supplies, and community awareness. Additionally, participants recommended that complementary communication plans should be developed. As suggested by participants, community-specific information was added to update community-level pandemic plans.

Remote and isolated First Nation communities faced some barriers during their 2009 H1N1 health sector pandemic response. Government bodies should focus efforts to provide more support in terms of human resources, monies, and education. In addition, various government organizations should collaborate to improve housing conditions, timely access to resources, and the level of coordination regarding health care delivery. Furthermore, as pandemic plans are dynamic, government bodies should continue to aide First Nation communities with updating their community-level pandemic plans to satisfy their evolving needs. These recommendations should be addressed so that remote and isolated western James Bay First Nation communities and other similar communities can be better prepared for the next public health emergency.

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DEDICATION

For my parents with much love … without them I would never be where I am or have the opportunity to go where I will in the future.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

AFN = Assembly of First Nations

AFNPP = Attawapiskat First Nation Pandemic Plan

CIHR = Canadian Institutes of Health Research

CPIPHS = The Canadian Pandemic Influenza Plan for the Health Sector

CDC = Centers for Disease Control and Prevention

CICM = Community Infection Control Measures

FAFNPP = Fort Albany First Nation Pandemic Plan

FNIHB = First Nations and Inuit Health Branch

FNIHB-OR = First Nations and Inuit Health Branch – Ontario Region

FNIHB-OR PIP = First Nations and Inuit Health Branch – Ontario Region Pandemic Influenza Plan

INAC = Indian and Northern Affairs Canada

ILI = Influenza-like Illness

JBGH = James Bay General Hospital

KFNPP = Kashechewan First Nation Pandemic Plan

KT = Knowledge Translation

MOHLTC = Ministry of Health and Long Term Care

OHPIP = The Ontario Health Plan for an Influenza Pandemic

PHAC = Public Health Agency of Canada

PHSPP = Peetabeck Health Services Pandemic Plan

PPE = Personal Protective Equipment

WHO = World Health Organization

CHAPTER 1: INTRODUCTION

1.0 Introductory Comments

In March 2009, an outbreak of a severe acute respiratory infection occurred in Mexico, now known to be caused by a novel influenza A virus subtype (Cutler et al., 2009). The H1N1 or "Swine" influenza - as it became informally referred to - sustained efficient human-to-human transmission and quickly spread worldwide causing the World Health Organization (WHO) on June 11, 2009, to declare the first global pandemic in 41 years (Chang, Shih, Shao, Huang, & Huang, 2009). Antigenically similar to the "Spanish" influenza of 1918, the H1N1 influenza is a contagious respiratory disease composed of reassorted influenza viruses enabling this strain to be easily transmitted from human-to-human through respiratory droplets (Chang et al., 2009).

During the 1918 "Spanish" influenza pandemic, some Aboriginal communities suffered a mortality rate of 50%, compared to the national mortality rate of non-Aboriginal communities of only 0.3% (Kermode-Scott, 2009). Similarly, recent studies have revealed that Aboriginal communities were disproportionately impacted during the 2009 H1N1 influenza pandemic (Kermode-Scott, 2009; Barker, 2010; Spence & White, 2010). Moreover, data have shown that Canada's remote First Nation populations were disproportionately affected by the H1N1 influenza virus (Kermode-Scott, 2009; Barker, 2010; Spence & White, 2010). Experts also claimed that federal data provided by the Public Health Agency of Canada (PHAC) has also underestimated the cases of H1N1 due to insufficient surveillance in First Nation communities leading to further inadequacies in pandemic responses (Webster, 2009).

Differences in social, economic, and environmental factors, along with differences in public health preparedness, may account for the high incidence rate of the H1N1 influenza in Aboriginal populations (Kermode-Scott, 2009). Experts report that the continuous lack of adequate federal funding and social policies have resulted in the current living situations experienced by numerous First Nation communities, which appear to promote virus transmission (Webster, 2009). Furthermore, similar to the 1918 "Spanish" influenza, the H1N1 influenza infected younger people at higher rates (Chang et al., 2009; Kumar et al., 2009). Considering that demographically, Aboriginal communities are skewed towards the younger age groups - and the

general wellbeing of Aboriginal children falls well below national averages - great concern is warranted (Kermode-Scott, 2009).The higher incidence rates of the 1918 and 2009 influenza pandemics in First Nation communities infers that their special needs are still not being met, particularly with regards to formulating and implementing culturally sensitive, ethical pandemic plans.

Reviewing the federal, provincial, and local pandemic influenza plans has revealed that some of First Nation communities' unique considerations are being recognized; however, it is unclear if the special needs of remote and isolated First Nation communities are actually being met (The Canadian Pandemic Influenza Plan for the Health Sector (CPIPHS), 2006; The Ontario Health Plan for an Influenza Pandemic (OHPIP), 2008). Little detail is provided regarding if proposed strategies in pandemic plans are feasible, effective, and how to realistically execute them in remote and isolated First Nation communities. It appears as if existing pandemic plans have not been properly informed by First Nation community members, mitigation strategies have not been formulated to be culturally sensitive, and proposed solutions continuously fail to address the underlying social factors (CPIPHS, 2006; OHPIP, 2008; Massey et al., 2009).

Including disadvantaged groups in the planning process is vital in order to address and protect their rights (Uscher-Pines, Duggan, Garoon, Karron & Faden, 2007). In addition, disadvantaged groups know best how they will be affected by a public health emergency, being able to identify barriers to current public health recommendations, and are in a position to create innovative mitigation strategies (Uscher-Pines et al., 2007). Disadvantaged groups typically distrust the government; however, including disadvantaged groups in pandemic planning will build trust and aide in creating effective pandemic plans (Uscher-Pines et al., 2007). Therefore, it is critical that governments identify and meet the needs of groups within their country who are economically and socially disadvantaged in order to mitigate the injustice that may occur during a public health emergency (Uscher-Pines et al., 2007).

1.1 Rationale

In Canada, the Assembly of First Nations (AFN) has reported that current federal and provincial pandemic plans do not adequately include First Nations' input (AFN, 2005). Remote First Nation communities of the James Bay coast faced outbreaks of the H1N1 pandemic influenza; however,

social factors (i.e., overcrowded houses, isolation, etc.) made recommended mitigation measures hard to execute (Romain, 2009). This study aimed to address the concerns of the Mushkegowuk Cree residing in remote and isolated First Nation communities of the western James Bay coast (i.e., Fort Albany, Attawapiskat, and Kashechewan) with regards to their pandemic response and how community-level pandemic plans can be modified to address their unique concerns.

1.2 Objective

One of the primary objectives of the study was to illuminate upon how the three study communities prepared and responded to the 2009 H1N1 influenza pandemic, if any barriers were encountered, and how these actions can be improved upon for the next public health emergency. Another primary objective was to discover if recommended pandemic planning components were executed effectively in the study communities. Community-based input was elicited to inform modifications to community-level pandemic plans, which can also be incorporated into future national and provincial pandemic influenza plans.

1.3 Thesis Structure

This thesis is structured into six chapters in a manuscript format.

Introductory comments regarding the background, rationale, and objective of the research is included in chapter one.

The literature reviewed in chapter two pertains to influenza, pandemics, and existing pandemic plans (special emphasis on sections addressing First Nations' concerns).

Chapters three and four contain the two manuscripts which have been modified to fit the structure of this thesis. Chapter three "The 2009 H1N1 Pandemic Response in Remote First Nation Communities of Sub-Arctic Ontario: Barriers and Improvements from a Health Care Services Perspective" presents the barriers faced and suggested improvements for the health sector pandemic response in three remote and isolated First Nation communities (In Press for the International Journal of Circumpolar Health). Chapter 4 "Government Bodies and their Influence on the 2009 H1N1 Heath Sector Pandemic Response in Remote and Isolated First Nation Communities of Sub-Arctic Ontario, Canada" presents how the three government bodies

involved in the delivery of health care to First Nations influenced the pandemic response in three remote and isolated First Nation communities.

Chapter five describes the knowledge translation endeavour of this research, in which the collected data was used to inform modifications to three remote and isolated First Nation community-level pandemic plans.

Chapter six summarizes the main outcomes and suggests future research endeavours.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

The objective of the literature review was to gather general information regarding influenza, influenza pandemics, existing pandemic plans, and First Nation communities' conditions. The search for literature was conducted between September 2009 and March 2011 using various search engines, including Google, Google Scholar, PubMed, and Web of Science. Searches were conducted using various combinations of the following keywords: remote, isolated, First Nation, Aboriginal, vulnerable populations, Canada, Ontario, influenza, influenza virus, pandemic, 2009 H1N1 influenza pandemic, pandemic planning, health care delivery. In addition, a search was conducted using the Google search engine to retrieve existing pandemic planning documents provided by the WHO, federal government, and provincial government in the English language published between 2003 to 2010.

2.1 Influenza

Influenza, commonly called the "flu", is a contagious respiratory illness caused by influenza viruses (Centers for Disease Control and Prevention (CDC), 2011). These influenza viruses can cause mild to severe illness in humans and depending on the severity of the season, between 2,000 and 8,000 Canadians can die of influenza and its complications annually (CDC, 2011; PHAC, 2011).

2.1.1 Populations at Risk

Some people are more at risk of seasonal influenza related complications, including elders (i.e., older than 65 years old), young children (i.e., younger than 5 years old), pregnant women, and people with certain underlying health conditions (i.e., diabetes, asthma, obesity, people with weakened immune systems, etc.) (CDC, 2011).

2.1.2 Symptoms

Common symptoms of the seasonal influenza include the following: fever, cough, chills, sore throat, headaches, tiredness, runny/stuffy nose, and muscle aches (Chang et al., 2009; CDC, 2011). Some patients may also experience diarrhea and vomiting; however, these symptoms are

more common in children (Chang et al., 2009; CDC, 2011). In addition, some complications may arise from getting influenza, such as: pneumonia, ear and sinus infections, and worsening of chronic medical conditions (CDC, 2011).

2.1.3 Diagnosis

Since a person with influenza displays clinical symptoms similar to that seen with other infectious agents, such as the cold, influenza may be difficult to diagnose based solely on clinical symptoms (CDC, 2011). If it is known that influenza is active in the community and it is during the influenza season, cases of influenza are typically diagnosed without testing (CDC, 2011). However, in order to properly diagnose influenza as the infectious agent, upper respiratory specimens, like nasopharyngeal aspirates and swabs are taken for laboratory testing (Peiris, Poon, & Guan, 2009).

2.1.4 Transmission of Influenza

Influenza can be transmitted from human-to-human via respiratory droplets that are expelled when an infected person coughs, sneezes, and/or talks (Chang et al., 2009). A person can also become infected by touching an infected surface and then touching his/her mouth or nose (CPIPHS, 2006). It is noted that influenza viruses can survive on surfaces longer in conditions of low humidity and cold temperatures (CPIPHS, 2006). Transmission of influenza can be reduced by some basic infection control methods, such as: respiratory etiquette, hand hygiene, surface disinfection, and self-isolation if ill (CPIPHS, 2006).

The period of communicability is when an infected person can spread the influenza virus to another person (First Nations and Inuit Health Branch – Ontario Region Pandemic Influenza Plan (FNIHB-OR PIP), 2009). It is important to note that the period of communicability of influenza starts 24 hours prior to the onset of symptoms; therefore, a person can infect other people with influenza before even knowing that he/she is sick (CDC, 2011). However, virus shedding and transmission is increased during the symptomatic period, which lasts approximately five to seven days after becoming infected (CPIPHS, 2006; CDC, 2011). The incubation period (i.e., the time between infection and developing symptoms) for influenza is one to three days (FHIHB-OR PIP, 2009).

2.1.5 Prevention of Influenza

Receiving the seasonal influenza vaccine is a recommended method to prevent getting the seasonal influenza (CDC, 2011). The influenza vaccine is indicated for everyone 6 months and older who does not have a contraindication to the vaccine. The influenza vaccine either contains the inactivated, killed virus or the attenuated (weakened), live virus - both will elicit an immune response – thus, creating the required antibodies to defend against an influenza infection (CDC, 2011). Substances called adjuvants are typically added to the inactivated influenza vaccine to increase the body's immune response to the vaccine; thus, smaller amounts of the virus are required when producing the vaccine (Coico & Sunshine, 2009). In general, the influenza vaccine is safe, although some common side effects may occur. The inactivated influenza vaccine may cause temporary soreness, redness, and/or swelling at the injection site, (low grade) fever, chills, and muscle aches (CDC, 2010). And the live influenza vaccine may cause a cough, runny nose, and/or sore throat (CDC, 2010).

2.1.6 Treatment of Influenza

Most people who fall ill with influenza will usually fully recover within two weeks (CPIPHS, 2006). However, some people with more severe infections may be prescribed antiviral therapy, ideally within 48 hours of illness onset (CPIPHS, 2006). Antiviral therapy may also be prescribed for prophylactic purposes for people who are at high risk of developing influenza (i.e., health care workers, first responders, etc.) (CPIPHS, 2006). Neuraminidase inhibitors and adamantanes are the two main types of antiviral drugs used to treat influenza. Neuraminidase is a viral enzyme responsible for facilitating the release of newly made viruses, thereby allowing the infection to spread (Wilkins, Stoller, & Scanlan, 2003). Neuraminidase inhibitors block the action of neuraminidase; thus, newly made viruses are not released from the host cell (Wilkins et al., 2003; Rau, 2002). On the other hand, adamantanes inhibit viral replication and assembly inside the host cell (Rau, 2002). Antiviral drugs may cause some side effects, such as nausea and vomiting; however, one main concern with using antiviral drugs is the possibility of creating antiviral resistant strains of the virus (Rau, 2002; Wilkins et al., 2003; Fleming, Elliot, Meijer, & Paget, 2009).

2.2 Influenza Viruses

Influenza is caused by influenza viruses and there are three types (i.e., influenza A, B, and C) which all belong to the family *Orthomyxoviridae* (Nakajima, 1997). Influenza A viruses will be focused on as they regularly cause epidemics, and they also have the potential to cause pandemics at irregular intervals (CPIPHS, 2006; WHO, 2005; WHO, 2009).

2.2.1 Influenza A Viruses

Influenza A viruses are enveloped and comprised of eight single, negatively stranded ribonucleic acid (RNA) which contains their genetic information (Kacmarek, Dimas, & Mack, 2005; McCance & Huether, 2006). These eight genes encode eleven proteins, which have various functions and may undergo adaptive mutations which have the potential to affect the virus's virulence and pathogenicity (Chang et al., 2009).

Influenza A viruses are subtyped according to the glycoproteins found on the lipid envelope of the virus, called hemagglutinin and neuraminidase, which are the key antigens that elicit an immune response in humans (Gatherer, 2009; Laver, Bischofberger, & Webster, 2000; Peiris et al., 2009). There are sixteen serotypes of influenza A hemagglutinin, which functions in binding the virus to the host cell (Gatherer, 2009). There are nine serotypes of neuraminidase, which functions in the exit of the virus from the host cell, allowing the virus to spread and infect other cells (Gatherer, 2009; Laver et al., 2000). Currently, the subtypes of influenza A that are circulating among people worldwide include: H1N1, H1N2, and H3N2 viruses (CDC, 2005).

Influenza A viruses originated from wild birds; therefore, wild birds are the natural host for all known subtypes of influenza A viruses (CDC, 2005). However, influenza A viruses can also infect other animals, such as, humans, pigs, and horses (CDC, 2005).

2.2.2 Stages of Viral Infection

Influenza viruses do not contain any metabolic organelles; therefore, to cause an infection and spread, viruses use a host cell's cellular machinery to replicate (Laver et al., 2000). To cause an infection, an influenza virus attaches to the host's respiratory tract epithelial cells (Rau, 2002; Wilkins et al., 2003). Once the virus attaches to the host cell, the virus enters, uncoats its

envelope, and begins replicating intracellularly using the host cell's cellular machinery (McCance & Huether, 2006; Rau, 2002). After the virus has replicated, the newly made viruses shed from the host cell, which usually kills the host cell in the process, to infect other host cells (Rau, 2002).

As mentioned, influenza A viruses are comprised of an eight segmented genome (Kacmarek et al., 2005; McCance & Huether, 2006). Additionally, RNA viruses replicate without a proofreading mechanism; therefore, many errors in genetic coding can occur which may cause mutations and reassortment; thus, creating novel influenza virus strains (Chang et al., 2009; Gatherer, 2009).

2.2.3 Evolution of Viruses

Viruses constantly evolve by means of antigenic drift and antigenic shift. These methods are referred to as antigenic variation, in which viruses escape host human immune responses by generating variants with different antigenic composition (Coico & Sunshine, 2009). Antigenic drift occurs often and refers to small, unpredictable, gradual changes that occur via point mutations in the two genes which encode hemagglutinin and neuraminidase (CDC, 2005; Nakajima, 1997). These point mutations result in minor changes to these surface proteins and produces new virus strains that may not be recognized by pre-existing antibodies, thereby reducing the effectiveness of previous seasonal vaccines (CDC, 2005). Antigenic shift occurs occasionally and refers to an abrupt, major change to produce a novel influenza A virus subtype that was not previously circulating amongst the human population (CDC, 2005). Antigenic shift can occur either through direct animal-to-human transmission or through the genetic reassortment of human and animal influenza A virus genes (CDC, 2005). The resulting new human influenza A virus subtype has the potential to cause a global influenza pandemic if certain conditions exist.

2.4 Pandemics

2.4.1 Definition of a Pandemic

An epidemic is a disease outbreak which occurs in one geographical location; however, if the disease outbreak spreads globally infecting many people and resulting in high mortality rates, it

is referred to as a pandemic (Peiris et al., 2009). Therefore, an influenza pandemic is an outbreak caused by a novel influenza A virus subtype that arises in one geographic location, but spreads worldwide causing global epidemics at the same time (Fitzgerald, 2009; CPIPHS, 2006; Peiris et al., 2009).

If certain conditions exist, there is a potential for a pandemic to ensue. First, there has to be a new influenza A virus arising from a major genetic change, like an antigenic shift (CPIPHS, 2006). Secondly, the virus has to be able to sustain efficient human-to-human transmission (CPIPHS, 2006). Thirdly, the virus has to be virulent enough to cause serious illness and death in humans (CPIPHS, 2006). Lastly, the virus has to be introduced into a susceptible population with little or no immunity (CPIPHS, 2006).

2.4.2 World Health Organization Pandemic Alert Phases

The WHO has developed six pandemic alert phases to guide the pandemic response. In general, Phases 1-3 reflect the need for preparedness and Phases 4-6 indicate the need for response (WHO, 2011a).

Table 1. Definitions of World Health Organization's Pandemic Alert Phases

Phase	**Definition**
Phase 1	No animal virus has been reported to cause human infection.
Phase 2	A circulating animal virus has been reported to cause human infection.
Phase 3	A circulating virus has caused clusters of human infection, but has not sustained efficient human-to-human transmission in order to cause a community-level outbreak.
Phase 4	A circulating virus has sustained efficient human-to-human transmission and is able to cause a community-level outbreak.
Phase 5	Indicates that a pandemic is imminent. A circulating virus has sustained efficient human-to-human transmission in at least two countries in one WHO region.
Phase 6	Indicates a global pandemic. A circulating virus has caused community-level outbreaks in at least one other country in a different WHO region,

	in addition to the criteria outlined for Phase 5.
Post-peak period	Levels of pandemic disease in most countries are decreasing below peak observed levels. Additional waves of the pandemic may still ensue.
Post-pandemic period	Levels of pandemic disease have decreased to normal expected levels.

Table adapted from WHO, 2011a

2.4.3 Canadian Activity Levels

The Canadian activity level indicator is noted after the decimal point of the WHO phase number (CPIPHS, 2006). The Canadian activity level reflects the observed activity of a new influenza virus specifically in Canada (CPIPHS, 2006).

Table 2. Definitions of Canadian Activity Levels

Canadian Activity Level	Definition
0	No new influenza virus activity is observed in Canada.
1	Single case(s) of infection is (are) observed in Canada.
2	Localized or widespread influenza activity is observed in Canada.

Table adapted from CPIPHS, 2006

2.4.4 Previous Pandemics

Historically, influenza pandemics occur three to four times each century, the number of cases usually peak in multiple waves separated by a three to nine month period, and each wave lasts about six to eight weeks (FNIHB-OR PIP, 2009). There have been three global influenza pandemics prior to the 2009 H1N1 influenza pandemic; all caused by an antigenic shift (Chang et al., 2009). From 1918-1919, the "Spanish" influenza was caused by a H1N1 subtype, in which 25% of the population was infected and resulted in approximately 50 million deaths worldwide (Shen, Ma, & Wang, 2009). Specifically in Canada, an estimated 30,000 to 50,000 people died during the "Spanish" influenza pandemic (CPIPHS, 2006). However, a majority of individuals died during this pandemic due to secondary bacterial pneumonia, since antibiotics were not available in 1918 (Taubenberger, Reid, & Fanning, 2000). From 1957-1963, the "Asian" influenza was caused by a H2N2 subtype and caused approximately 1.5 million deaths

worldwide (Gatherer, 2009). From 1968-1970, the "Hong Kong" influenza was caused by a H3N2 subtype and resulted in approximately 1 million deaths worldwide (Gatherer, 2009).

2.5 The 2009 H1N1 Pandemic Influenza

2.5.1 Background

In March 2009, an outbreak of a severe acute respiratory infection occurred in Veracruz, Mexico (Chang et al., 2009). The cause of human infection and H1N1's spread amongst the human population is still unknown; more studies need to be conducted to identify molecular markers to determine how an animal influenza A virus crossed the species barrier to infect humans (Chang et al., 2009).

H1N1 is a novel influenza A virus subtype that sustained efficient human-to-human transmission, has the virulence ability to cause human disease, and a vast amount of the human population does not have prior immunity (Wang & Palese, 2009). The 2009 H1N1 pandemic was relatively mild since the virus did not contain the known pathogenicity marker, the PB1-F2 protein (Wang & Palese, 2009; Shen et al., 2009). As of August 1, 2010, more than 214 countries, overseas territories, and/or communities worldwide had reported laboratory confirmed cases of the 2009 H1N1 pandemic virus, and it caused over 18,449 deaths (WHO, 2011b). Canada experienced two distinct waves of the 2009 H1N1 influenza pandemic (PHAC, 2010a). The first wave occurred from April 12, 2009 to August 29, 2009, and peak activity was noted in early June (PHAC, 2010a). The second wave occurred from August 30, 2009 to January 27, 2010 during which substantially higher hospitalization and death rates were noted (PHAC, 2010a). In Canada, there have been at least 426 deaths due to the 2009 H1N1 pandemic influenza as of January 28, 2010 (PHAC, 2010b). On August 10, 2010, the WHO declared that we had moved into a post-pandemic period, although localized outbreaks were likely to still occur (WHO, 2011c).

2.5.2 Origin

As mentioned, influenza A viruses can infect multiple host species, including: birds, humans, and pigs (CDC, 2005). Pigs have been suggested to act as a "mixing vessel" for influenza viruses due to the presence of both avian and mammalian receptors (Vincent et al., 2009). A single

swine has the potential to be dually infected by both avian and human influenza viruses allowing for reassortment to occur between the genome of swine, avian, and human viruses (Vincent et al., 2009).

The origin of the novel H1N1 subtype is quite complex considering its genome includes segments from prevalent swine, avian, and human influenza viruses. Influenza A viruses of H1N1 subtype are all avian in origin; however, multiple viruses have reassorted and antigenic drift has occurred amongst the various host species, which has created the current novel H1N1 influenza virus composed of a genome segment combination that has not been previously identified (Chang et al., 2009; Laver et al., 2000; Garten et al., 2009).

2.5.3 Populations at Risk, Symptoms, Diagnosis, and Transmission

Groups at higher risk of getting the 2009 pandemic H1N1 influenza and related complications were similar to those for seasonal influenza (CDC, 2009). However, Aboriginal populations were highly impacted (Kermode-Scott, 2009; Barker, 2010; Spence & White, 2010). Interestingly, the H1N1 pandemic influenza virus affected a much younger age demographic since the elderly appeared to have some cross-protection due to pre-existing antibodies (Chang et al., 2009; Kumar et al., 2009; Peiris et al., 2009; Dawood et al., 2009).

Common symptoms of mild cases of H1N1 are similar to the symptoms experienced when suffering from the seasonal influenza (Chang et al., 2009). Severe cases of H1N1 may cause hospitalization, pneumonia, respiratory failure, and sometimes death (Chang et al., 2009). H1N1 is diagnosed and transmitted in the same fashion as seasonal influenza (Peiris et al., 2009; Wang & Palese, 2009).

2.5.4 Prevention of the 2009 H1N1 Pandemic Influenza

A strain of H1N1 has co-circulated since 1977 and has been included in the annual seasonal vaccines (Wang & Palese, 2009; Peiris et al., 2009). However, there is an antigenic gap between the seasonal H1N1 strain and the pandemic H1N1 strain (Peiris et al., 2009). Research has shown that vaccination with recent seasonal nonadjuvanted or adjuvanted influenza vaccines induced little to no cross-reactive antibody response to the 2009 pandemic H1N1 strain in any age group (Hancock et al., 2009).

2.5.5 Treatment of the 2009 H1N1 Pandemic Influenza

The 2009 H1N1 influenza can be treated with antivirals, similar to how seasonal influenza is treated. H1N1 is currently sensitive to neuraminidase inhibitors, but resistant to adamantanes (Chang et al., 2009). Patients with severe cases of H1N1 may suffer from severe hypoxemia and multisystem organ failure (Kumar et al., 2009). These patients may require admittance into an intensive care unit, prolonged mechanical ventilation, and the use of lung rescue therapies (Kumar et al., 2009).

2.6 Review of Existing Pandemic Plans (with special emphasis on sections addressing First Nations)

Novel influenza A viruses have the ability to cause high morbidity and mortality rates since most of the human population will have little to no immunity to the novel strain (Oshitani, 2006). Data has revealed that vulnerable populations (i.e., First Nations) will be disproportionately affected by a pandemic situation, thereby exacerbating established social inequalities (WHO, 2009; Lee, Rogers, & Braunack-Mayer, 2008). Therefore, ethically addressing the needs of disadvantaged populations should be a cornerstone of pandemic planning and the subsequent implementation of pandemic plans (Lee et al., 2008). Nations worldwide have created pandemic plans which repeatedly exclude general ethical considerations (Kotalik, 2005). Kotalik (2005) reviewed three existing national pandemic plans (of Canada, United States of America, and United Kingdom) and revealed that these plans have been heavily guided by expert scientists and do not adequately address relevant ethical values that should guide the decision-making process of pandemic plans, such as, how to allocate scarce resources and implementation of communication strategies. For instance, all individuals are affected by a pandemic; however, it appears that certain populations have not been involved in the pandemic planning process nor have they been informed of the decisions made which will affect them (Kotalik, 2005). Kotalik (2005) states that pandemic plans require transparent communication and collaboration of all levels of the government, public sector, private sector, and voluntary sector, in addition to every citizen. In order for information to be effective, the person must be able to access the information in addition to having the ability and resources to comply with the provided information (Lee et al., 2008). In the case of First Nation communities, there are issues of if they have access to culturally appropriate information and whether the mitigation methods are feasible (Massey et al., 2009). For instance, the control

measure of isolation is commonly recommended; however, this strategy may not be feasible in a house in which many people reside, which is typical in First Nation communities (Massey et al., 2009). Therefore, it is imperative that recommended mitigation methods in pandemic plans are effective and culturally sensitive in order to increase compliance and reduce virus transmission.

This section will review existing pandemic plans of the WHO, federal government, provincial government, and First Nation communities; special emphasis will be placed on sections which address First Nations' concerns.

2.6.1 World Health Organization Guidelines and Checklist, 2005 and 2009

In light of the 2003 outbreak of severe acute respiratory syndrome (SARS) and the threat of the highly pathogenic H5N1 avian virus, being prepared for a public health emergency is vital in order to mitigate the ensuing social and economic disruptions (WHO, 2009). In order to assist nations in creating pandemic plans, the WHO provides various guidance reports and checklists with invaluable information (WHO, 2009; WHO, 2005). Although WHO acknowledges that vulnerable populations will be disproportionately affected by a pandemic (usually due to low income), the special concerns of "vulnerable and minority groups" is only briefly mentioned (WHO, 2009; WHO, 2005). For instance, it is mentioned that an ethical framework should be used to address the needs of various groups, including vulnerable and minority groups (WHO, 2009). However, the document does not specifically state that nations should be addressing the needs of groups who are socially and economically disadvantaged (Uscher-Pines et al., 2007). In addition, WHO suggests that during Phase 4, affected countries should "gather feedback from the public, vulnerable populations and at-risk groups on attitudes towards the recommended measures and barriers affecting their willingness or ability to comply" and use this feedback to creak effective communication campaigns (WHO, 2009, p. 42). In general, WHO's guidelines continue to suggest a universal approach to pandemic planning and do not adequately convey how nations can accomplish addressing the concerns of vulnerable populations (WHO, 2009; WHO, 2005).

2.6.2 The Canadian Pandemic Influenza Plan for the Health Sector, 2006

The Canadian Pandemic Influenza Plan for the Health Sector (CPIPHS) (2006) provides an in-depth outline of the actions the health sector should take before, during, and after a pandemic

with the goal of reducing deaths and societal disruptions in Canada due to an influenza pandemic (CPIPHS, 2006). The document applies universal methods which should be revised at the community level to address the concerns of the local people (CPIPHS, 2006). Annex B, entitled "Pandemic Influenza Planning Considerations in On-reserve First Nation Communities", describes some comments specifically addressing First Nation communities which are recommended to be taken into consideration during the planning process (CPIPHS, 2006). The CPIPHS states that federal, provincial, and territorial governments are responsible for providing health services to First Nation and Inuit populations (CPIPHS, 2006). However, Health Canada's First Nations and Inuit Branch (FNIHB) is responsible for delivering health services to remote isolated, isolated, and semi-isolated on-reserve First Nation communities (CPIPHS, 2006). These communities are responsible for creating their own community pandemic plans with the support of FNIHB and provincial health authorities (CPIPHS 2006). Therefore, the CPIPHS provides a table outlining proposed activities and responsibilities for relevant jurisdictions (CPIPHS, 2006). Although progress has been made in addressing the needs of First Nation communities in a pandemic influenza situation, there remain gaps in the informal collaborations (i.e., adequate surveillance and communication) that have occurred between Health Canada's FNIHB and provincial governments (CPIPHS, 2006). However, the CPIPHS claims that formal arrangements are in place to ensure equitable access of First Nation communities to vaccines, antivirals, and emergency equipment (CPIPHS, 2006). Six components of pandemic preparedness are concentrated on, including: surveillance, vaccine programs, antivirals, health services emergency planning, public health measures, and communications (CPIPHS, 2006). These six issues will be outlined including comments of whether considerations for remote and isolated First Nation communities were incorporated.

Influenza surveillance is particularly important during a pandemic in order to monitor the virus's impact, including vital laboratory surveillance of the virus's antigenic drift and shift (CPIPHS, 2006). The PHAC manages the national surveillance system, entitled FluWatch (CPIPHS, 2006). It is vital for pandemic planners of First Nation communities to be aware of provincial laboratory testing guidelines including where and how specimens should be sent (CPIPHS, 2006).

After the pandemic virus strain has been identified and a vaccine has been developed, vaccinating the entire population will be a primary action (CPIPHS, 2006). Jurisdictions are

encouraged to follow national recommendations on priority groups since initial vaccine production will not be sufficient to vaccinate the entire population (CPIPHS, 2006). During the 2009 H1N1 influenza pandemic, national authorities recommended First Nation populations as a priority group since they may be socially and economically disadvantaged, have numerous risk factors, and have limited access to health care (PHAC, 2009). Local, regional, provincial, and federal levels of government are responsible for ensuring that First Nation communities receive timely and equitable distribution of the vaccine once it is available (CPIPHS, 2006). With regards to remote First Nation communities, the CPIPHS states that pandemic planners of these communities need to consider how they will receive, store, and administer the vaccine (CPIPHS, 2006).

Since it may take up to five months before a vaccine is available due to the time required to identify the virus strain and amount of antigen needed, antivirals are effective as prophylaxis and treatment of influenza (CPIPHS, 2006). Canada has established a National Antiviral Stockpile in order to provide antiviral treatment for citizens (CPIPHS, 2006). It has been confirmed that First Nation communities meeting the criteria will have access to the National Antiviral Stockpile; however, First Nation communities themselves are responsible for the proper distribution of antivirals within their community (CPIPHS, 2006). The CPIPHS states that all government levels should address the feasibility of establishing an antiviral stockpile in remote and remote-isolated First Nation communities in order to ensure timely and equitable access to treatment for people who meet the criteria (CPIPHS, 2006).

FNIHB is responsible for providing or funding health care services for First Nation communities (CPIPHS, 2006). The CPIPHS provides some helpful mitigation strategies to address the unique considerations of First Nation community pandemic planning (CPIPHS, 2006). First of all, it is recommended that planners maintain respect for the traditional knowledge and culture of First Nation communities in order to create an effective pandemic plan (CPIPHS, 2006). Secondly, remote First Nation communities have the potential to suffer from lack of access to care and resources; therefore, planners are encouraged to find possible solutions, such as nearby First Nation communities working together in a mutually beneficial manner (CPIPHS, 2006). Thirdly, First Nation community planners are encouraged to familiarize themselves with their Medical Officer of Health, who may be a helpful resource during a pandemic (CPIPHS, 2006). Fourthly,

it is advised that pandemic planners are acutely aware of their community's access to health care services and their respective safety standards since it varies across the nation (CPIPHS, 2006). In addition, establishing alternative care sites may be required by some First Nation communities in order to treat an influx of patients; therefore, this possibility should be addressed by planners (CPIPHS, 2006). Furthermore, some patients may need to be transferred to acute care hospitals; therefore, planners should be aware of proper infection control precautions and alternative options if transportation is not possible (CPIPHS, 2006). Fifthly, during a pandemic situation, there is a high potential to have a lack of health care workers; therefore, the CPIPHS recommends that pandemic planners have mitigation strategies in place, such as teaching self-assessments which can be performed at home and looking for alternative sources of health care workers (CPIPHS, 2006). Sixthly, during a pandemic, there may be a possible influx of First Nation community members seeking to visit or take care of family, practice cultural traditions, and receive access to health care services; therefore, this issue should be addressed by pandemic planners (CPIPHS, 2006; Groom et al., 2009). Lastly, considering the geographical location of some First Nation communities, transportation of supplies may become increasingly difficult during a pandemic; therefore, planners are urged to negotiate contracts with transportation services (CPIPHS, 2006).

Public health measures recommended by the CPIPHS during a pandemic include voluntary self-isolation, school/workplace closures, and cancellation of public gatherings (CPIPHS, 2006). However, there is no mention of whether these measures are effective and feasible in remote and isolated First Nation communities.

Public communication will be vital during a pandemic in order for citizens to be well informed of the situation and how to properly respond (CPIPHS, 2006). The CPIPHS states that national communication strategies focus on "developing communications that are based on a solid understanding of what people know about pandemic influenza, what they do not know, and what they want and need to know" (CPIPHS, 2006, section three-preparedness p. 19). However, there is no mention of whether these communication strategies are culturally sensitive and accessible for members of remote and isolated First Nation communities.

With regards to First Nation communities, the CPIPHS also addresses issues of proper infection control practices and culturally respectful burials (CPIPHS, 2006). Infection control practices

such as hand washing, use of personal protective equipment (PPE), and proper cough etiquette are encouraged for all citizens, including members of First Nation communities (CPIPHS, 2006). During a pandemic, local authorities will have to deal with an increase in deaths due to influenza; therefore, attendance to funerals may be restricted as an infection control measure (CPIPHS, 2006). The CPIPHS states that it is the responsibility of the Medical Officer of Health to determine if restrictions on large social gatherings are necessary and effective (CPIPHS, 2006). Furthermore, since First Nation people have special directives for funeral services, the CPIPHS claims that local authorities can communicate with Band Councils (i.e., the elected local governments of First Nations) in these situations to receive culturally appropriate information (CPIPHS, 2006). The CPIPHS addresses that transporting bodies to their burial location may be an issue for "northern and isolated communities"; therefore, planners are recommended to take into consideration the lack of funeral resources and potential transportation difficulties (CPIPHS, 2006).

In general, the CPIPHS devotes a well-intentioned annex to addressing the needs of First Nation communities; however, little specific detail is provided on how to attain the numerous lofty proposed goals and considerations (CPIPHS, 2006).

2.6.3 The Ontario Health Plan for an Influenza Pandemic, 2008

The Ontario Health Plan for an Influenza Pandemic (OHPIP) aims to reduce the "morbidity and mortality associated with influenza pandemics" and includes a chapter entitled "Guidelines for First Nations Communities" (OHPIP, 2008). The OHPIP states that during a pandemic, it is assumed that rural, remote, or isolated First Nation communities may experience disruption of health care services and resources (i.e., antivirals, vaccines, etc.) due to transportation difficulties, in addition to having to use available technology to the fullest in order to communicate and access information (OHPIP, 2008).

In this chapter issues of surveillance, health human resources, antivirals and vaccine, supplies and equipment stockpiles, influenza centres/alternate care sites, communications, and transportation are discussed (OHPIP, 2008). FNIHB developed a surveillance system which monitors influenza-like illness (ILI) (i.e., acute onset of respiratory illness with fever, cough, and either sore throat, joint pain, muscle pain, and/or physical weakness) for all First Nation

communities and reports information to the Ministry of Health and Long-Term Care (MOHLTC) (OHPIP, 2008; CPIPHS, 2006). With regards to health human resources, FNIHB is currently working with First Nation communities to develop a pandemic health human resources plan, which will clearly outline health care workers who will provide health care during a pandemic (OHPIP, 2008). During a pandemic, the OHPIP is aiming for equitable access to antivirals and vaccines for First Nation communities (OHPIP, 2008). The province is responsible for distributing antivirals to FNIHB, who in turn will distribute the antivirals to First Nation communities (OHPIP, 2008). The First Nation communities are responsible for developing plans to properly store and distribute antivirals (OHPIP, 2008). The OHPIP states that timely distribution of antivirals to isolated First Nation communities may be difficult; therefore, MOHLTC has provided FNIHB with a small stockpile of antivirals which FNIHB may distribute immediately to First Nation communities requiring them (OHPIP, 2008). First Nation community members will be able to access vaccines through their local public health units and hospitals and their staff will be responsible for properly storing and distributing the vaccines (OHPIP, 2008). With regards to stockpiling equipment (i.e., N95 respirators, gowns, gloves, etc.), FNIHB is responsible for providing First Nation communities with a four-week supply (OHPIP, 2008). MOHLTC will have an additional four-week supply of equipment which is available for First Nation communities (OHPIP, 2008). As for establishing influenza centres/alternative care sites, FNIHB is collaborating with First Nation communities to choose places which would be suitable to act as alternate care site to provide additional health care services during a pandemic; however, funding had not yet been secured at the time of this report (OHPIP, 2008). The OHPIP claims that First Nation communities will have equitable access to information with the help of FNIHB (OHPIP, 2008). Lastly, the OHPIP acknowledges that some remote First Nation communities are dependent on air transport to transfer equipment and ill patients; therefore, FNIHB is responsible for paying costs of additional transportation needs and negotiating appropriate contracts (OHPIP, 2008).

2.6.4 Ministry of Health and Long Term Care - Guidance on Public Health Measures for the Pandemic H1N1 Influenza Virus in First Nation Communities, 2009

The MOHLTC also published a document to help guide First Nation communities (MOHLTC, 2009). The document clearly states that First Nation communities are at a higher risk of receiving H1N1 due to health conditions (i.e., diabetes, pregnancy, etc.), age demographics (i.e., 46% of Ontario's Aboriginal population are under the age of 25 years old), environmental conditions (i.e., crowded housing, lack of access to clean water, etc.), and social factors (i.e., travel, large social gatherings, etc.) (MOHLTC, 2009). Therefore, MOHLTC suggests some public health measures for First Nation communities including proper hand washing, cough etiquette, isolation of sick people (either within a room in a house or at an alternative care site if available), alternative sleeping arrangements, identifying a sole caregiver for sick people, and sick people wearing a surgical mask or an alternative to reduce virus transmission (MOHLTC, 2009). In addition, people are encouraged to regularly clean their houses, stockpile equipment (i.e., cleaning supplies, tissues, etc.), cancel large social gatherings (MOHLTC provides a tool to help the Band Council decide if this is necessary), and take care of children (especially if schools are closed) (MOHLTC, 2009).

2.6.5 First Nations and Inuit Health Branch – Ontario Region: Pandemic Influenza Plan, 2006

The First Nations and Inuit Health Branch – Ontario Region Pandemic Influenza Plan (FNIHB-OR PIP) outlines aspects of the Ontario Region's influenza pandemic response (FNIHB-OR PIP, 2006). The document covers topics such as: pandemic influenza, pandemic planning, roles and responsibilities, and components of preparedness and response. A chapter is dedicated to outlining the roles and responsibilities of the federal government, MOHLTC, local health units, FNIHB-OR, and local First Nation communities during three phases (i.e., pre-pandemic, pandemic, and post-pandemic) (FNIHB-OR PIP, 2006). Each phase is organized according to seven components of preparedness and response (i.e., surveillance, vaccine, antivirals and antibiotics, health services, emergency response, public health measures, communications).

FNIHB-OR updated the July 2006 pandemic influenza plan in October 2009; however, the former version will be reviewed since the community-level pandemic plan of each study community closely resembles it (FNIHB-OR, 2006). The actions recommended for local First Nation communities in the FNIHB-OR PIP will be reviewed followed by the revisions that were made in each study community's pandemic plan prior to February 9, 2010, when my research commenced.

The FNIHB-OR PIP outlines the actions local First Nation communities should take prior, during and after a pandemic (FNIHB-OR PIP, 2006). Prior to a pandemic, various people (i.e., physicians, nurses, band staff, etc.) are responsible for reporting ILI data to FNIHB (FNIHB-OR PIP, 2006). The Band Council is responsible for estimating the population size of the community, while physicians and nurses are mainly responsible for organizing the mass immunization clinic (FNIHB-OR PIP, 2006). With regards to antivirals and antibiotics, health care personnel (i.e., physicians and nurses) are responsible for developing a list of community members who meet the criteria for antiviral treatment and identifying a secure location for antivirals to be stored (FNIHB-OR PIP, 2006). Various people (i.e., physicians, nurses, band staff, etc.) are responsible for developing human resource contingency plans, determining which health services are considered essential, planning for alternate care sites, and creating equipment lists for health facilities (FNIHB-OR PIP, 2006). Nurses are also given the responsibility of providing self-care training (FNIHB-OR PIP, 2006). With regards to emergency response, physicians, nurses, and Band staff (i.e., health director, community health representatives, etc.) are responsible for developing and revising community emergency preparedness and response plans (FNIHB-OR PIP, 2006). The community spiritual leaders are mainly responsible for developing a corpse storage plan along with identifying a temporary morgue site in the community (FNIHB-OR PIP, 2006). The Band Council is to ensure that business continuity plans are in place for services provided within the community, such as, non-medical transportation and social services (FNIHB-OR PIP, 2006). The Band Council is mainly responsible for the implementation of public health measures within the community, while physicians and nurses are primarily responsible for promoting infection control practices within health care settings (FNIHB-OR PIP, 2006). The Band Council is also primarily responsible for developing a communication plan which will be executed if a pandemic is declared (FNIHB-OR PIP, 2006).

During a pandemic, surveillance of ILI cases in the community will be increased (FNIHB-OR PIP, 2006). Once vaccines are available, physicians and nurses are to commence the mass immunization clinic, monitor uptake levels, and report any adverse effects (FNIHB-OR PIP, 2006). Physicians and nurses are responsible for monitoring the availability, demand, distribution, uptake, and adverse effects of antivirals in the community (FNIHB-OR PIP, 2006). Physicians, nurses, and band staff are required to activate human resource contingency plans, maintain the provision of essential health services, and establish an alternate care site if needed (FNIHB-OR PIP, 2006). The Band Council is mainly responsible for the emergency response by activating the emergency preparedness and response plans and business continuity plans within the community (FNIHB-OR PIP, 2006). Physicians, nurses, and Band staff are to implement public health measures, such as isolation and closures (FNIHB-OR PIP, 2006). And the community is to designate a spokesperson who will inform the community about the pandemic response (FNIHB-OR PIP, 2006).

After a pandemic, it is recommended that communities resume routine activities (FNIHB-OR PIP, 2006). All plans (i.e., mass immunization clinic protocols, human resource contingency plans, etc.) are to be evaluated and revised as needed (FNIHB-OR PIP, 2006).

2.6.6 Community-Level Pandemic Plans of Fort Albany, Attawapiskat, and Kashechewan (as of February 9, 2010)

Although the study communities' pandemic plans closely resembled FNIHB-OR PIP (2006), some revisions were made prior to the 2009 H1N1 pandemic response which differed. For instance, in some cases, community-based people were designated and appropriate locations for activities were identified. The Fort Albany First Nation Pandemic Plan (FAFNPP) and the Kashechewan First Nation Pandemic Plan (KFNPP) included a page entitled "Areas to consider for business continuity planning for each Band program" which contained a list of issues that should be addressed, for example, that psychological support for employees should be arranged (FAFNPP, 2006; KFNPP, 2009). In addition, prior to the 2009 H1N1 influenza pandemic, the health director of Fort Albany First Nation developed the Peetabeck Health Services Pandemic Plan (PHSPP), a pandemic plan specifically for the federally funded health center (PHSPP, 2009). The PHSPP included frameworks for ordering influenza pandemic supplies,

responsibilities of the outbreak control team, a list of self-care training topics (to be provided by nurses), and methods of distributing health information to community members (PHSPP, 2009).

The aforementioned community-level pandemic plans included recommendations provided by the CPIPHS, OHPIP, and FNIHB-OR PIP; however, some vital details are not included. For instance, the pandemic plans lacked community emergency preparedness and response plans and corpse storage plans. Also, it was noted that the Attawapiskat First Nation Pandemic Plan (AFNPP) excluded all of the post-pandemic phase components except for communications; and the KFNPP omitted one post-pandemic phase section (i.e., antivirals and antibiotics) (AFNPP, 2009; KFNPP, 2009).

CHAPTER 3: THE 2009 H1N1 PANDEMIC RESPONSE IN REMOTE FIRST NATION COMMUNITIES OF SUB-ARCTIC ONTARIO: BARRERIS AND IMPROVEMENTS FROM A HEALTH CARE SERVICS PERSPECTIVE

3.0 Overview

Objective: To retrospectively examine the barriers faced and opportunities for improvement during the 2009 H1N1 pandemic response experienced by participants responsible for the delivery of health care services in three remote and isolated sub-arctic First Nation communities of northern Ontario, Canada.

Study design: A qualitative community-based participatory approach.

Methods: Semi-directed interviews were conducted with adult key informants (n=13) using purposive sampling of participants representing the three main sectors responsible for health care services (i.e., federal health centers, provincial hospitals, and Band Councils). Data were manually transcribed and coded using deductive and inductive thematic analysis.

Results: Primary barriers reported were issues with overcrowding in houses, insufficient human resources, and inadequate community awareness. Main areas for improvement included increasing human resources (i.e., nurses and trained health care professionals), funding for supplies, and general community awareness regarding disease processes and prevention.

Conclusions: Government bodies should consider focusing efforts to provide more support in terms of human resources, monies, and education. In addition, various government organizations should collaborate to improve housing conditions and timely access to resources. These recommendations should be addressed in future pandemic plans, so that remote western James Bay First Nation communities of sub-arctic Ontario and other similar communities can be better prepared for the next public health emergency.

3.1 Introduction

The 2009 H1N1 influenza, caused by a novel influenza A virus subtype, quickly spread worldwide causing the first global pandemic declaration in over four decades (Chang et al., 2009). Reports have shown that Canada's First Nations population were disproportionately impacted by the 2009 H1N1 influenza virus, especially remote communities (Kermode-Scott, 2009; Barker, 2010). A "remote" community is defined as one located over 350 kilometers from the nearest service centre having year-round road access; while, an "isolated" community is only accessible by planes year-round (CPIPHS, 2006).

People living in remote and isolated First Nation communities were faced with unique challenges during the pandemic which must be addressed by pandemic planners (Groom et al., 2009). In remote First Nation communities, federal, provincial, and First Nations governments share responsibility for the delivery of health care services (CPIPHS, 2006). Inadequate social policies and insufficient federal funding have negatively impacted primary health care services, community level surveillance, and housing in First Nation communities (Webster, 2009). Although living in an isolated community may initially act as a buffer with respect to exposure to an infectious disease, if a pathogen is introduced into an isolated community, the living conditions (e.g., overcrowded housing, impoverished lifestyle) appears to promote virus transmission (Groom et al., 2009). Additionally, transportation of supplies and resources may be limited, and can be especially challenging in harsh weather conditions (OHPIP, 2008). Moreover, there are vulnerable populations within First Nation communities who suffer from various co-morbidities (e.g., diabetes, obesity), placing them at greater risk of becoming infected by a novel pathogen (Kermode-Scott, 2009; Barker, 2010).

It is critical that governments address the concerns of economically and socially disadvantaged groups in order to mitigate the injustice that may occur during a public health emergency (Uscher-Pines et al., 2007). To the point, in Canada, the Assembly of First Nations (AFN) has noted that there has been very little inclusion of First Nations' input into current federal and provincial pandemic plans (AFN, 2005).

The purpose of the present paper is to retrospectively examine the barriers encountered by three geographically remote and isolated First Nation communities during the 2009 H1N1 pandemic

response from a health care perspective; and identify culturally appropriate opportunities for improvement informed by participants, which should be incorporated into future pandemic plans.

3.2 Materials and Methods

3.2.1 Study Community Profiles

The three study communities are located in the western James Bay region of northern Ontario with on-reserve population sizes estimated at 850, 1,700, and 1,800, respectively (Ruby Edwards-Wheesk, pers. comm., 2010). These three First Nations were chosen for this study since all are remote and isolated being located in one geographical region (Figure 1), with similar living conditions (Indian and Northern Affairs Canada (INAC), 2010a; INAC, 2010b). In addition, community-based health care providers felt that existing pandemic plans did not properly address their communities' unique conditions.

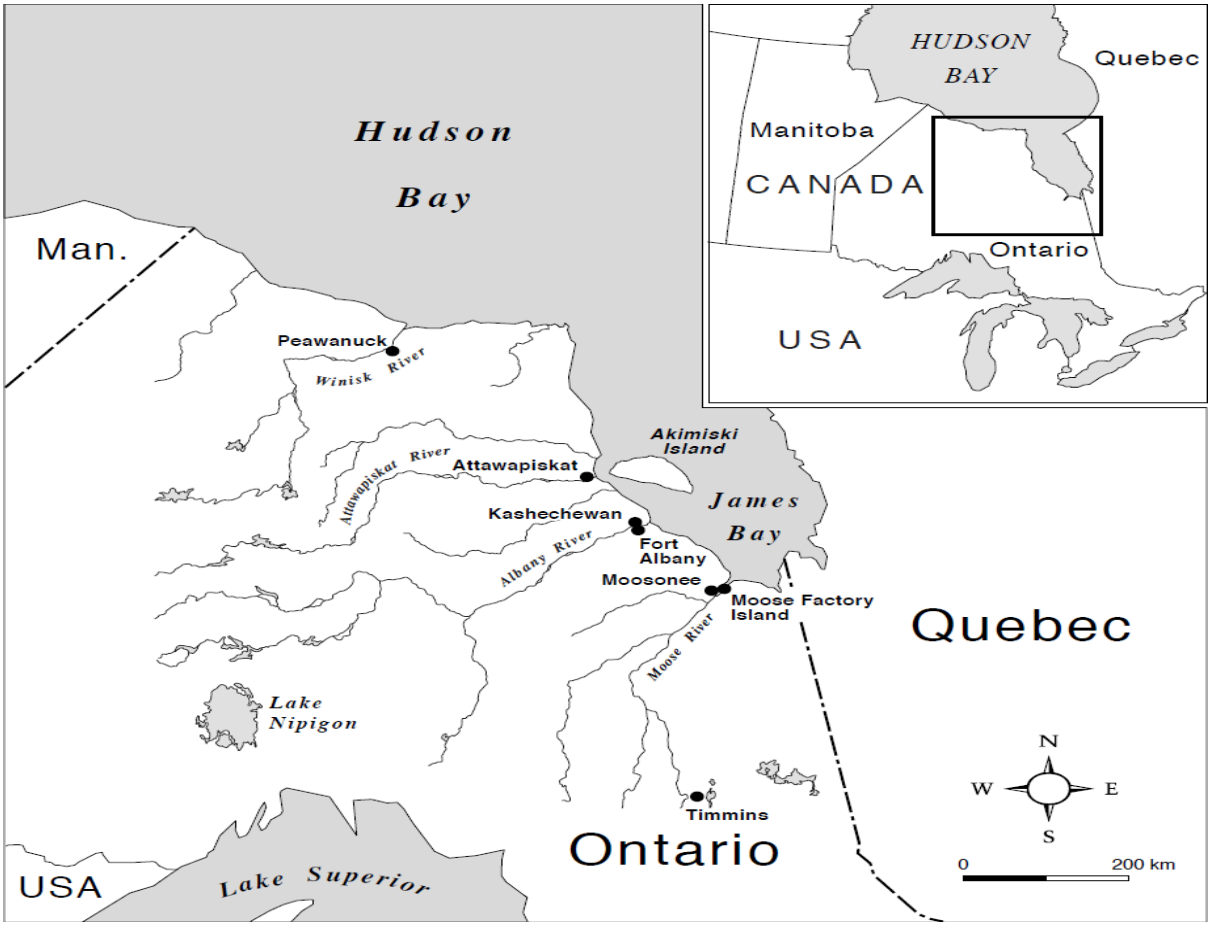
Each First Nation (or Band) is governed by an elected Chief and Council. All three communities have a federally-funded health centre for community public health and a primary health care facility covered by 24-hour nursing care. Two communities have a wing of a provincial hospital; while, the third community has a federal nursing station. Although these primary care facilities have selected medical equipment, any patients requiring surgery or care beyond the capabilities of the nursing staff must be transported to the nearest accommodating facility (Tsuji, 1998).

3.2.2 Study Population

Using purposive sampling, participants (n=13) were chosen by the researchers who had the authority to represent the three government sectors (i.e., federal, provincial, and First Nations) responsible for making decisions and implementing each study community's pandemic response from a health services perspective (Neuman & Robson, 2009). The health director manages the federal health center, while the nurses-in-charge and community health nurses are responsible for a wide variety of health care activities, including immunizations. The director of patient care is in charge of the provincial hospital wing and the clinical coordinator is responsible for managing primary care activities of front line health care workers, such as, dispensing of antiviral treatment. The community with a nursing station has a nurse-in-charge who has a similar role as

the clinical coordinator. Lastly, the Band Council has the ultimate decision making power when responding to a pandemic; chosen participants included the elected Chief and/or deputy Chief.

Figure 1. Location of remote and isolated communities of western James Bay, northern Ontario, Canada.



3.2.3 Community-based Participatory Approach

This research can be described as a community-based participatory approach, as it directly involved First Nation community members and allowed for the finding and implementation of culturally appropriate and relevant solutions (Davis & Reid, 1999; Macaulay et al., 1998). A community-based advisory group was formed of five participants representing the communities' health centers and Band Councils to ensure the study met the needs of the communities and was conducted in a culturally appropriate manner. The community-based advisory group actively collaborated with the authors to develop the study's objectives, design, interview questions and

protocols. In addition, they validated the results and aided in disseminating the study's findings. Ethics clearance was granted through the Office of Research Ethics at the University of Waterloo.

3.2.4 Data Collection

Qualitative data were collected by semi-directive interviews with 13 adult key informants during the period February 9 to 23, 2010, after community illness rates returned to baseline levels, thus participants had a period of time to reflect on their community's pandemic response. Being culturally appropriate for the western James Bay region, verbal informed consent was obtained and interview questions were vetted through the community-based advisory group (Skinner, Hanning, & Tsuji, 2006; Kirby, Lévesque, Wabano, & Robertson-Wilson, 2007). Semi-directive interviews were used to gain an in-depth understanding of interviewees' perspectives (Neuman & Robson, 2009). To encourage elaboration, questions were open-ended and frequent probes were used (Minore et al., 2005). The interview questions were developed based on academic literatures of health care service aspects of a pandemic response, including questions about identifying positive aspects, barriers faced and opportunities for improvements. For the participants' convenience, interviews were done at their chosen place and time, and individual interviews lasted from approximately 15 minutes to 1.5 hours. The interviews were in English and audio recorded with permission of the participant, with notes also being taken.

3.2.5 Data Analyses

Transcribing, coding, categorizing, and analysis of the data was conducted by the author (NAC) and confirmed by the co-author (LJST). Data from the interviews were manually transcribed verbatim into electronic format. Codes were created using deductive and inductive thematic analysis. This combination approach allowed for the use of "theory-driven" codes derived from previous research and "data-driven" codes which emerged from the raw data itself (Fereday & Muir-Cochrane, 2006). During deductive coding, a template organizing approach was employed which utilized the framework outlined in the existing regional FNIHB pandemic influenza plan as a coding template (FNIHB-OR PIP, 2006; Crabtree & Miller, 1999). Seven broad codes were used as a template to organize similar segments of data and provide a flexible guide for subsequent analysis and interpretation (Fereday & Muir-Cochrane, 2006; Crabtree & Miller,

1999). Inductive coding was used for data that described a new code which emerged from the data (Boyatzis, 1998). For instance, segments of data regarding supplies and equipment were previously coded as health services; however, after reviewing the participant's interview transcripts, supplies emerged as a separate code. The data within each of the resulting eight codes was further categorized according to interview trigger questions (i.e., positive aspects, barriers faced, and suggested improvements), always noting which community and health sector the commenting participant represented (Fereday & Muir-Cochrane, 2006). This approach allowed for the data to be analyzed revealing connections and overarching themes regarding the similarities and differences experienced during the pandemic response within and between each community. The data analysis was an iterative process and was completed several times to ensure accuracy.

The resulting eight codes were presented in paper format and verbally validated (no subsequent changes were proposed) by each community's pandemic committee, which comprised of representatives (8 to 10 people attended) from various sectors involved in the community's pandemic response: Band Council, health center, James Bay General Hospital (JBGH), education, clergy, Northern store, water treatment plant, and emergency medical services. This method of validating the resulting codes beyond the interviewed participants (although their respective sectors maintained representation during the community pandemic committee meeting) was employed because the theory and data-informed codes would subsequently comprise the framework for each community's modified community-level pandemic plan thereby directly applying the study's findings (Sandelowski, 1997).

3.3 Results

The details of six codes (e.g., vaccine, antivirals, health services, supplies, public health measures, and communications) are presented, as two codes (e.g., surveillance and emergency response) were selectively omitted to allow for the presentation of the most relevant results in the present paper. Representative quotes were used to accurately reflect participants' tone and views; however, for confidentiality purposes, which community and health sector a participant represented was not identified (Minore et al., 2005; Knafl & Howard, 1984).

3.3.1 Vaccine

Participants from all of the communities reported that enough doses of the vaccine were received and good uptake rates were noted in their respective community. One community reported an estimated pandemic vaccine uptake rate of 80 percent, significantly higher than Canada's estimated rate of between 40 and 45 percent (PHAC, 2010a). However, a community had experienced an influenza outbreak prior to receiving the pandemic H1N1 vaccine.

Participants from two communities expressed that their communities' mass immunization clinic (MIC) went smoothly. For instance, one of these communities was sent three support workers from Health Canada and implemented a modified immunization certification course to train additional health care personnel to vaccinate. In addition, all workers donned personal protective equipment (PPE) and patients with influenza-like illness (ILI) symptoms were separated and given surgical masks.

However, one community's participants revealed that they experienced issues with their MIC. For instance, there was a lack of human resources (i.e., trained nurses and auxiliary staff); thus, the nurses who were vaccinating fell ill due to exhaustion and not having adequate time to don PPE. It was suggested that additional human resources should be secured by providing training for community members to act as auxiliary staff (i.e., crowd control, security, etc.), which would free the nurses from other tasks and allow them the opportunity to solely concentrate on vaccinating. Participants also requested that training be provided to nurses to be able to perform immunizations and deploy nurses capable of vaccinating to their community to help at the next MIC. In addition, since the nurses were not provided with information on how to properly run a MIC, it became a harsh learning experience; a simulation would be helpful prior to the next MIC.

3.3.2 Antivirals

Participants from all three communities believed that they received enough doses of antivirals. However, the more timely distribution of antivirals was an issue. Also, some participants reported that they received antivirals which had short expiry dates. Indeed, a participant mentioned,

… the first bunch we received, I was surprised the expiry date was a month and a half after we receive[d] it … (Participant #8).

3.3.3 Health Services

Participants from all three communities felt there was a lack of human resources during their pandemic response; their health care facilities were short-staffed and staff felt overworked. A participant mentioned that,

... we were left to do everything on our own … (Participant #1).

Also, a participant believed that they would not have been able to cope and provide adequate patient care if their community had been more severely impacted by the pandemic. In addition, a participant noted that there was a lack of trained health care personnel and equipment in the communities, especially for severely ill patients requiring mechanical ventilation.

With regards to an alternate care site (ACS), all three communities discussed the possibility and feasibility of opening one which would function as a satellite center providing necessary health services. In all communities, various possible locations for an ACS were suggested. However, some participants stated that funding and human resources required to open an ACS must be secured prior to the next pandemic alert.

3.3.4 Supplies

Participants from all communities felt that their communities' health facilities (i.e., health centres and JBGH) had an adequate amount of supplies for their pandemic response. Nevertheless, one community's health centre chartered in a plane with supplies (i.e., masks, gowns, gloves and hand sanitizers) paid out from their own capital, since their allotted resources from FNIHB did not arrive in a timely manner. Several participants experienced further challenges with receiving supplies in a timely fashion, which brought up issues of how supplies, especially food, can be adequately stockpiled ahead of time, especially if transportation was compromised.

Also, most participants believed that there was a lack of funding for supplies and provision of supplies, especially surgical masks and hand sanitizers, for the community itself. One participant

reported that instead of receiving needed hand sanitizers, the community received body bags. The participant felt that,

> *… the government of Canada doesn't want to help the Native people … because it was cheaper … to send 500 body bags* (Participant #11).

Some participants felt that it was unfair that community members were obligated to purchase individual infection control supplies, since this proved to be especially difficult for low income families. Participants from each community expressed that they would like infection control supplies to be provided for the community and that there should be funding in place to purchase supplies for the next emergency; as one participant mentioned,

> *… a fund or some kind of formal arrangement in a pandemic, First Nation communities are always vulnerable to begin with because you're isolated …* (Participant #5).

3.3.5 Public Health Measures

Each community agreed that overcrowding in houses was an issue since it may promote virus transmission and it was not feasible to segregate ill family members. Therefore, in some ways, overcrowding in houses made it difficult for community members to follow recommended public health guidelines.

Some additional issues were reported with respect to following isolation recommendations in that ill health-care workers sent home to isolate themselves were subsequently seen out in the community even though community gatherings had been cancelled. However, in general, most participants reported that community infection control measures were followed within the community despite the fact that some complained the measures were unnecessary. For instance, people wore surgical masks, avoided handshakes and stockpiled supplies (if available) when directed. Additionally, participants reported that modifying cultural practices at funeral services, such as limiting attendance and avoiding physical contact (i.e., hugging and kissing), was generally well received.

3.3.6 Communications

All three communities formed a community pandemic committee. All participants from one community believed that their pandemic committee encompassed a team approach by collaborating and cooperating, which led to effective communication. However, two communities' participants suggested that more support and participation from all key players would have been beneficial in order to develop and implement community wide recommendations, especially during the early stages of pandemic preparation. Additionally, a participant suggested that receiving feedback from the pandemic committee would be valuable to ensure that all members comprehended the subsequent actions to be taken. One participant stated,

> … *we needed cooperation from the leadership, and also from the people to start taking things seriously* … (Participant #13).

Nevertheless, some participants reported good communication within their respective organizations. For instance, a participant commented that weekly teleconferences were helpful, as additional information was provided and questions answered. Participants also reported that they were in constant communication with their neighbouring coastal communities to share information and provide support in a mutually beneficial manner.

A majority of participants stated that they received information from multiple media sources (i.e., internet, television, radio) which were misleading at times. Specifically, participants felt that the media attention sensationalized the pandemic resulting in unnecessary hype and panic in their communities. Additionally, a participant stated that the information received was too generalized to be helpful in the context of living in a remote community. The participant questioned,

> … *that's a lot of information, but at the same time, is it geared here to the community or is it geared to somewhere else?* (Participant #1).

Participants from all communities felt there was a general lack of community awareness during the pandemic even though various dissemination strategies, such as, radio, posters, and/or

pamphlets were employed. For instance, some community members did not understand the disease process of influenza, effects of the pandemic vaccine, and importance of community infection control measures. All participants agreed that more education and awareness are required to be better prepared.

In summary, although each community's participants emphasized various concerns, common positive aspects, barriers faced, and opportunities for improvement regarding all study communities' pandemic response were identified (Table 3).

3.4 Discussion

In general, remote and isolated First Nation communities possess several distinct characteristics which affected their pandemic response, such as, geospatial isolation, living conditions, culture, and governance. The results of this qualitative study helped to inform the following recommendations for government officials to address in order to improve these and similar communities' health sector pandemic response (Table 4).

Table 3. Positive aspects, barriers faced, and opportunities for improvement regarding the pandemic response in three remote and isolated First Nations communities.

Positive Aspects	Barriers	Opportunities for Improvement
Vaccine -Good uptake -Received enough doses	Public Health Measures -Overcrowding in houses	Supplies -More funding
Antivirals -Received enough doses	Health Services -Lack of human resources	Health Services -More human resources
Supplies -Health facilities had enough	Communication -Poor community awareness	Communication -More community awareness

Table 4. Participants' suggested recommendations and additional considerations for government officials to address for future pandemic plans.

Participants' recommendations
- Distribute resources (i.e., vaccines, antivirals, supplies) in a timely fashion - Provide additional supplies for community use - Establish an emergency fund - Recruit nursing staff - Deploy interdisciplinary team of health care professionals - Secure funding and human resources for alternate care site - Implement disease awareness education sessions - Deliver more regional and community specific information
Additional considerations
- First Nations and Inuit Health Branch (federal organization) and Ministry of Health and Long-Term Care (provincial organization) should re-evaluate resource distribution plans - First Nations and Inuit Health Branch should collaborate with the communities to develop a food supply plan - Improve housing conditions - Declare pandemic committee meetings mandatory

3.4.1 Distribute resources in a timely fashion

In general, participants believed that distributing resources (i.e., vaccines, antivirals, and pandemic supplies) in a timely fashion needs to be improved upon.

Some participants believed that vaccines were not timely distributed to their communities, although they received an adequate amount. Vaccination is the best way to prevent influenza related complications; however, the development of a pandemic vaccine could take up to five months after the strain has been identified (OHPIP, 2008; Sullivan, Jacobson, Dowdle, & Poland, 2010). Therefore, research focusing on increasing the pace and capacity of pandemic vaccine development and production should be a priority (Fedson, 2003). Once the pandemic vaccine is available, it is the responsibility of all government levels to ensure First Nation communities receive a timely and equitable distribution (CPIPHS, 2006).

Additionally, a timely distribution of antivirals continues to be an ongoing global challenge (Leung & Nicoll, 2010). Considering geographically remote and isolated areas are difficult to

access and transport supplies to, special care should be taken to ensure these communities do not receive shipments of antivirals with relatively short expiry dates (OHPIP, 2008).

While all communities stated their health facilities had enough supplies, these supplies (i.e., masks, gowns, gloves, and eye protection) were sometimes not distributed in a timely fashion to the region. FNIHB and the MOHLTC are responsible for ensuring that health facilities in First Nation communities have a continuous stockpile of pandemic supplies (OHPIP, 2008). In addition, FNIHB should work in collaboration with remote First Nation communities to develop a plan of how food supplies can be adequately transported and stockpiled during a pandemic.

Therefore, we suggest that all government levels collaborate to re-evaluate resource distribution plans, so remote First Nation communities receive needed resources in a timely fashion (OHPIP, 2008).

3.4.2 Increase funding for disease outbreaks

It is the responsibility of provincial ministries and federal departments to provide supplies for workers who provide critical infrastructure services (OHPIP, 2008). However, all communities felt there was an inadequate amount of supplies for their community. In agreement with previous studies (Massey et al., 2009), some participants stated certain households could not afford supplies. Participants suggest that government officials focuses efforts on providing additional supplies to First Nation communities and establish an emergency fund that can be accessed to purchase supplies for disease outbreaks.

3.4.3 Increase human resources

Health Canada's FNIHB is responsible for delivering public and primary health care services (if provincial services are not available) to remote and isolated First Nation communities (CPIPHS, 2006). However, studies have shown that geographically isolated First Nation communities have less access to health care services and experience shortages of trained health care professionals (MacMillan, MacMillan, Offord, & Dingle, 1996). Being geographically remote and isolated presents a barrier to recruiting and retaining nurses in these communities; additionally, studies have shown that high turnaround rates of nursing staff can pose negative effects on the provision of health services (Minore et al., 2005; Minore, Boone, & Hill, 2004). Nurses are the main

providers of primary-care in these communities; therefore, FNIHB and JBGH should continue to focus efforts on recruiting a full-time, permanent complement of nurses in these communities which have undergone proper orientation in order to prepare them for the demanding nature of the job and expose them to the importance of First Nations' traditional values (Minore et al., 2005; AFN, 2007). Further, as suggested by participants, FNIHB and JBGH should include plans to deploy an interdisciplinary team of health care professionals specializing in respiratory therapy, mental health, disease education, and post-pandemic psychological debriefing to provide additional services, if required.

3.4.4 Improve plans for an Alternate Care Site

The CPIPHS (2006) recommends that communities have guidelines in place to address the likely situation that health care facilities will become overwhelmed during an influenza pandemic. However, the Ontario Health Plan for an Influenza Pandemic (OHPIP) (2008) states that sources of funding for equipment and infrastructure for ACSs have not yet been identified. Therefore, participants suggested that government officials secure funding and human resources for an ACS and include details in community pandemic plans.

3.4.5 Improve living conditions

In 1876, the Indian Act entitled registered Indians on reserves to housing, education, and health care (MacMillan et al., 1996), either as a treaty right or fiduciary responsibility. Although, improvements have been made, impoverished crowded housing remains a problem in numerous First Nations communities (Smeja & Brassard, 2000; Tsuji, Iannucci, & Iannucci, 2000). Overcrowding in houses has been associated with increased probability of infectious respiratory disease transmission (Clark, Ribena, & Nowgesicb, 2002). Indeed, it has been reported that houses with many inhabitants posed issues to preventing disease spread (Massey et al., 2009). Therefore, government officials need to continue to focus efforts on improving the housing conditions in remote First Nations communities.

3.4.6 Increase education and participation

Some participants mentioned that community members did not always follow infection control recommendations and there was a lack of support from key players of the pandemic committee.

This can be attributed to the reported lack of community awareness regarding the pandemic, disease processes, and the effectiveness of proposed public health measures. Public communication is essential for community members to understand the situation and how to respond (CPIPHS, 2006). In First Nation communities, it is vital that educational programs are modified to respect their culture; for instance, how they interpret illness and their holistic approach to health issues (AFN, 2007; Young, Reading, Elias, & O'Neil, 2000). Participants suggested community educational sessions to stress the importance of immunization, infection control, and general disease prevention. Furthermore, participants commented that it would be advantageous if government officials provided regional and community specific information geared towards influenza mitigation in a remote community.

Also, to make pandemic preparedness a political priority and ensure participation by key players, local Band Councils can declare pandemic committee meetings as mandatory (AFN, 2007).

3.5 Conclusion

This qualitative study presents information to raise awareness about the unique needs of geographically remote and isolated First Nation communities during a public health emergency, which aims to improve current policies and plans. Government bodies should focus efforts to provide more support to these communities in terms of human resources, monies, and education. Additionally, resource distribution plans and housing conditions must be improved to lessen the impact social factors have on these communities.

The identification of elements common to all of the communities' pandemic response may aide other remote and/or isolated communities improve their pandemic response. Furthermore, lessons learned from the 2009 H1N1 pandemic response may be transferable to improving how seasonal influenza epidemics and perhaps other communicable diseases are managed. Future studies should focus on how to feasibly improve the pandemic response capacity by remote and isolated First Nation communities.

CHAPTER 4: GOVERNMENT BODIES AND THEIR INFLUENCE ON THE 2009 H1N1 HEALTH SECTOR PANDEMIC RESPONSE IN REMOTE AND ISOLATED FIRST NATION COMMUNITIES OF SUB-ARCTIC ONTARIO, CANADA

4.0 Overview

Introduction: First Nation communities were highly impacted by the 2009 H1N1 influenza pandemic. Multiple government bodies (i.e., federal, provincial, and First Nations) share responsibility for the health sector pandemic response in remote and isolated First Nation communities and it may have resulted in a fragmented pandemic response. Our study aimed to discover if and how the dichotomy (or trichotomy) between involved government bodies led to barriers faced and opportunities for improvement during the health sector response to the 2009 H1N1 pandemic in three remote and isolated sub-arctic First Nation communities of northern Ontario, Canada.

Methods: A qualitative community-based participatory approach was employed. Semi-directed interviews were conducted with adult key informants (n=13) using purposive sampling of participants representing the two (or three) government bodies of each study community. Data were manually transcribed and coded using deductive and inductive thematic analysis to reveal positive aspects, barriers faced, and opportunities for improvement along with the similarities and differences regarding the pandemic responses of each government body.

Results: Common primary barriers faced by participants included receiving contradicting governmental guidelines and direction from many sources. In addition, there was a lack of human resources, information sharing, and specific details in community-level pandemic plans. Recommended areas of improvement include developing a complementary communication plan, increasing human resources, and updating community-level pandemic plans.

Conclusions: Participants reported many issues that may be attributable to the dichotomy (or trichotomy) between the multiple government bodies responsible for health care delivery during a pandemic. Increasing formal communication and collaboration between responsible government bodies will aide in clarifying roles and responsibilities and improve the pandemic response in remote and isolated First Nation communities.

4.1 Introduction

Canada's First Nation populations appeared to have been severely impacted by the 2009 H1N1 influenza pandemic (Kumar et al., 2009; Kermode-Scott, 2009). First Nation populations are predisposed to becoming ill from an infectious disease due to various reasons, including the following: living conditions, impoverished lifestyles, presence of co-morbidities, and (in some cases) being geographically remote (Kermode-Scott, 2009; Barker, 2010; MacMillan et al., 1996; OHPIP, 2008).

In 1876, the Indian Act entitled registered Indians on reserves to health care (MacMillan et al., 1996). In Canada, the provision of health care to the general Canadian population is the responsibility of the provincial/territorial governments; however, registered Indians are entitled to additional non-insured health benefits provided by the federal government (Tsuji, 1998). Therefore, First Nation communities are unique in that federal, provincial, and First Nation governments share responsibility of the delivery of health care services (CPIPHS, 2006). Historically, there has been a lack of coordination between the provincial and federal governments with regards to providing health care for Aboriginals (Tsuji, 1998; MacMillan et al., 1996). During a pandemic influenza, the various involved government organizations have yet to clearly define roles and responsibilities and establish all of the necessary formal agreements, which may cause a fragmented pandemic response (CPIPHS, 2006).

In this study, we present a retrospective insight into barriers faced by three government sectors (i.e., federal, provincial, and First Nations) in three remote and isolated First Nation communities of northern Ontario, Canada, during the health sector response to the 2009 H1N1 influenza pandemic. In addition, participants identified culturally appropriate opportunities for improvement, which should be addressed in future pandemic plans.

4.2 Methods

4.2.1 Study community profiles

The three study communities (referred to as Community A, B, and C for anonymity purposes) are located in northern Ontario, Canada. All three communities have similar living conditions and are considered geographically remote (the nearest service center with year-round road access

is located over 350 kilometers away) and isolated (only accessible by planes year-round) (CPIPHS, 2006) (Table 5). An elected Chief and Council (or Band Council) governs each First Nation community and are key decision makers regarding how a pandemic is managed. Health Canada's FNIHB is responsible for the provision of primary health care (if provincial services are not available) and public health services in geographically remote and isolated First Nation communities (CPIPHS, 2006; OHPIP, 2008). All three study communities have a health center for community public health services. During an influenza pandemic, community public health personnel roles included immunizations, case and contact management, and education. Additionally, each community has a primary care facility - during a pandemic - primary care facility personnel are responsible for providing medical care and dispensing treatments. These primary care facilities are covered by 24-hour nursing care with sporadic physician visits, and possess selected medical equipment; however, any patients requiring care beyond their capabilities must be transported to the nearest accommodating health care facility (Tsuji, 1998).

Table 5. Characteristics of the study communities

Characteristic	Community A	Community B	Community C
Public health facility	Federal health center	Federal health center	Federal health center
Primary care facility	Provincial hospital wing	Provincial hospital wing	Federal nursing station

4.2.2 Community-based participatory approach

These three communities were chosen for the following reasons: geo-spatial proximity to one another; community members expressed an interest in examining how effective their pandemic plan was meeting the needs of the community; and the desire of the First Nations to actively participate in the planning process in preparation for the next public health emergency. The authors formed a partnership with the study communities and this research can be described as a community-based participatory approach. All aspects of the study were developed and implemented in collaboration with a community-based, advisory group formed of representatives from the communities' health centers and Band Councils (Macaulay et al., 1998). For instance,

the community advisory group approved the interview questions to ensure they were valid and culturally appropriate (Kirby et al., 2007). This type of approach has been shown to be successful for research with Aboriginal communities in that the research is conducted in a culturally appropriate manner and directly meets the needs of the communities (Macaulay et al., 1998; Davis & Reid, 1999). Ethics clearance to conduct this research was granted through the Office of Research Ethics at the University of Waterloo.

4.2.3 Data collection and sources

Participants were purposively chosen from each study community who had the authority to represent and who were particularly informative about their respective government body's involvement in the 2009 H1N1 pandemic response (Neuman & Robson, 2009). Specifically, the health director/supervisor, nurse-in-charge, and/or community health nurse at the health centers (or nursing station) were selected as the federal government representatives. The director of patient care and/or clinical coordinator at the hospital wing were the selected provincial representatives. Lastly, First Nations government representatives included the Chief and/or Deputy Chief of each community's Band Council.

Interviews were conducted with 13 adults during the period from February 9 to 23, 2010 to gain an in-depth account of participants' experience during the 2009 H1N1 pandemic response (Neuman & Robson, 2009). Being culturally appropriate for the First Nation communities, verbal informed consent from participants was obtained (Skinner et al., 2006; Kirby et al., 2007). Interviews were semi-directive to ensure consistent questions were asked based on academic literatures of health care service aspects of a pandemic response. This method also allowed for flexibility as participants were able to elaborate on what they felt was important (Daly, 2007). Individual interviews lasted from 15 minutes to 1.5 hours long and were conducted in English at a convenient place and time for the participant. With the participant’s permission, interviews were audio recorded and detailed notes were taken.

4.2.4 Data management and analyses

Interviews were manually transcribed verbatim into electronic format. Collected data were organized according to “theory-driven” and “data-driven” codes using a combination of deductive and inductive thematic analysis (Fereday & Muir-Cochrane, 2006). Using a template

organizing approach, the seven broad codes of the regional FNIHB pandemic influenza plan were used to provide a flexible guide to deductively code relevant data (Crabtree & Miller, 1999; FNIHB-OR PIP, 2006; Fereday & Muir-Cochrane, 2006). Via inductive coding, segments of data pertaining to supplies and equipment were coded as a newly emerged code (Boyatzis, 1998). For subsequent analysis and interpretation, the data were further categorized according to main interview trigger questions (i.e., positive aspects, barriers faced, and suggested improvements), always noting which community and government body the commenting participant represented (Fereday & Muir-Cochrane, 2006). This approach was chosen to allow for comparisons regarding the similarities and differences experienced during the pandemic response within and between each government body within the three study communities. The aforementioned data analysis was an iterative process completed by the author (NAC) and confirmed by the co-author (LJST) to ensure accuracy.

Members of each study community's pandemic committee validated the resulting eight codes. Attending members included representatives from various sectors involved in the community's pandemic response: Band Council, health center, hospital wing, education, clergy, Northern store, water treatment plant, and emergency medical services. Eight to ten people attended each community meeting and no changes were proposed. This validation method was chosen because the resulting codes would create the framework for each community's modified community-level pandemic plan; thus, directly applying the study's findings (Sandelowski, 1997).

4.3 Results

Data analyses revealed eight codes; however, three codes (e.g., vaccine, supplies, and public health measures) were selectively omitted to present the most relevant results pertaining to the present paper. Representative quotes were used to highlight key findings; however, for anonymity purposes, information about the commenting participant will not be disclosed (Minore et al., 2005; Knafl & Howard, 1984).

4.3.1 Surveillance

Influenza surveillance involves the collection of information about influenza-related cases in order to determine the severity and potential impact of influenza activity (CPIPHS, 2006). In general, participants representing the provincially run hospital wing believed that the

surveillance system employed during the pandemic response worked well, despite being initially complicated. One participant mentioned that feedback from surveillance reports would be appreciated to ensure proper actions were being executed.

In Community A and B, some issues arose with regards to when specimens from patients should be taken for laboratory testing, since some federal representatives disagreed with their counterpart's instructions. This led to pressure to not follow their respective organization's guidelines; for instance, a provincial representative mentioned,

> *… it was people wanting to put pressure on us, but we're walking a fine line because we had to follow the guidelines set down by the medical officer of health [provincial jurisdiction], but at the same time, try to relieve the pressure from public health [federal government personnel] …* (Participant #2).

Some federal representatives noted that there was a lack of information sharing with the provincial agency with regards to which patients were being tested in order to promptly and properly conduct case and contact management. These representatives noted that they only received a report if a positive case had been confirmed. In addition, federal representatives believed that the provincial hospital wing did not promptly set up a designated assessment area for patients with ILI symptoms and suggested that improving influenza assessments should be a priority for the next time.

4.3.2 Antivirals

In two communities, participants agreed that the antivirals were efficiently distributed, in that patients who met the guidelines received the needed treatment. In contrast, federal and provincial participants from one community were in disagreement. Although the provincial representative stated that they followed the provided guidelines, federal participants believed that the antivirals were not efficiently distributed. It was reported that only 22 doses were distributed out of the 424 received doses even though many community members were displaying ILI symptoms. The federal representatives indicated that they would like antivirals to be better distributed, including for prophylactic purposes.

4.3.3 Health Services

Representatives from each government body agreed that there was a lack of human resources, especially nurses, during the pandemic response in each study community. As one participant stated,

> *… they [nurses] were expected [to do] too much and they didn't have enough additional staff to do it. Cause the hospital room was really packed in the evenings, and they didn't have enough nurses to work with the people. And they did their best, and I think we, they were overtired, overburdened …* (Participant #7).

Moreover, a participant remarked that due to the shortage of human resources, they were unable to follow up with ill families to provide necessary support and believed this should be improved upon. The participant remarked,

> *Even if there was a house... affected with H1N1, if a family were affected, we didn't even touch base on how we know what they're short on and stuff like that, what they need* (Participant #9).

Many participants mentioned that they want more human resources available for future pandemics, especially nurses and trained personnel with the expertise to deal with a public health emergency.

4.3.4 Emergency Response

In one community, the federal representatives felt that certain aspects of the emergency response section of the pandemic plan were not adequately addressed in a timely manner. The federal representatives reported that isolation and quarantine issues were not specified and implemented. In addition, the federal representatives stated that details with regards to a morgue were not adequately addressed and that there was no appropriate site in the community, especially if a public health emergency occurred in the spring time. A federal representative questioned,

> *… we didn't go into it that if there were more deaths in the community, where would the bodies be stored? You know so, who would be handling the bodies?* (Participant #10).

However, the provincial participant stated that the provincial organization had a morgue plan in place and had established a site. Therefore, the federal participants believed that specific information regarding morgue, isolation, and quarantine issues should be properly outlined in the community-level pandemic plans after in-depth discussions with the community pandemic committee.

4.3.5 Communications

All provincial representatives stated that they were prepared for the outbreak, although it took a few days to implement aspects of the response and improvements could be made to increase efficiency. In contrast, some federal and Band representatives from each study community believed that their respective community was not prepared for the pandemic for various reasons, such as lack of resources and cooperation from key players of the community pandemic committee. A participant mentioned,

> *Yeah, so we weren't really ready for this pandemic situation. So, it's like that in a remote area, we're the last one to get the resources and it's very unfortunate …* (Participant 7).

Some provincial representatives reported that they received contradicting guidelines from many sources and were initially extracting the best information from each direction. Since this was confusing, they eventually decided to only follow their respective organization's direction, although these directions were sometimes ambiguous and changed frequently. Federal representative also noted that they received different information than the provincial body at different times. This discrepancy between provincial and federal instructions led to a fragmented approach along with multiple disagreements and confusion amongst the federal and provincial representatives from both Community A and B. As one participant mentioned,

> *As you can understand, we're provincial, the other side over there, is federal, so they were having their guidelines, and we were having our guidelines, and their guidelines sometimes were different than our guidelines, and we found that very confusing* (Participant #2).

Another participant noted,

> *… it was like a lot of different information[s] coming in, it would have been nice just to see one, one person reporting and that would have been either the province or feds, didn't matter what which one. It would have been nice to have one just at a region, you know, just had a regional one …* (Participant #1).

One participant also noted that each agency had its own respective pandemic plan in addition to the community pandemic plan. With multiple pandemic plans in place, the participant stated that there was confusion with regards to each agency's roles and responsibilities during a pandemic.

4.4 Discussion

In general, participants reported many issues which may be attributable to the dichotomy (or trichotomy) between the multiple government bodies responsible for health-care delivery during an influenza pandemic. Interestingly, participants from Community C did not report some of these issues, possibly due to the fact that both the health center and nursing station are federally funded. The CPIPHS (2006) states that the involved government bodies have very few formal arrangements in place and gaps remain with regards to managing a pandemic influenza outbreak in First Nation communities; thus, the present study's results have informed the following recommendations which can be achieved by increasing formal communication and collaboration amongst the government bodies.

4.4.1 Improve communication plans

The Bellagio Group stresses the importance of equitable access to accurate and easily understood information during an influenza pandemic (Johns Hopkins Berman Institute of Bioethics, 2006). The CPIPHS (2006) states that it is the responsibility of all levels of the government (i.e., local, regional, provincial, and federal) to provide on-reserve First Nation communities with accurate, timely and consistent information during an influenza pandemic. However, participants reported that these multiple sources of information were sometimes inconsistent, misleading, and contradictory; therefore, participants suggested that one reliable source should provide the

necessary information. We recommend that all levels of government collaborate to create a consistent and complementary communication effort, especially when providing guidelines. Additionally, based on the literature, we recommend that the regional FNIHB be the source to provide the necessary information to First Nation communities.

4.4.2 Update community-level pandemic plans

Adequate preparedness plans should be developed and in place to mitigate the impact of an influenza pandemic (Oshitani, Kamigaki, & Suzuki, 2008; WHO, 2009). The WHO has developed various tools to help countries with their preparation for an influenza pandemic, including a preparedness planning checklist (Oshitani et al., 2008; WHO, 2005). While national planning is imperative to make recommendations and set standards, planning at the community level is also vital to warrant that these measures can be effectively implemented (Hampton, 2007). The WHO tools, along with the current national and provincial pandemic plans, offer universal methods which may not be feasible in remote and isolated First Nation communities due to their unique challenges (i.e., living conditions, lack of access to resources and health care, presence of co-morbidities) (Oshitani et al., 2008; WHO, 2005; CPIPHS, 2006; OHPIP, 2008; Groom et al., 2009; MacMillan et al., 1996; Kermode-Scott, 2009; Barker, 2010). FNIHB regions have developed regional pandemic influenza plans and should continue to assist First Nation communities to develop community-level pandemic plans which are appropriately modified to specifically meet their requirements (CPIPHS, 2006).

For instance, the use of non-pharmaceutical interventions, such as isolation and quarantine, may be useful in mitigating the effects of a pandemic, especially due to the limitations of availability and effectiveness of pharmaceutical interventions like vaccines and antivirals (Aledort, Lurie, Wasserman, & Bozzette, 2007; OHPIP, 2008; Sullivan, Jacobson, Dowdle, & Poland, 2010; Fedson, 2003; Leung & Nicoll, 2010; Oshitani, 2006; Low, 2008). Thus, it is important that community-level pandemic plans contain specific information about various non-pharmaceutical interventions that can be implemented.

In addition, historic data has shown that over 70% of a population may become infected by a novel virus during a pandemic; therefore, plans to manage mass fatalities should be addressed in community-level pandemic plans (CPIPHS, 2006). These plans should be based on local needs

and availability of resources, in addition to local limitations and cultural considerations (CPIPHS, 2006). For instance, northern remote and isolated communities may face difficulties with transportation of bodies to the place of burial and lack of funeral service personnel and resources (CPIPHS, 2006). Therefore, as suggested by participants, the aforementioned issues should be specifically addressed in community-level pandemic plans.

Furthermore, the CPIPHS (CPIPHS, 2006) provides a well-intentioned table outlining the roles and responsibilities of the partners involved in the management of a pandemic influenza in on-reserve First Nation communities. However, participants mentioned that roles and responsibilities were not clearly defined and executed at the local level. It is recommended that these communities, with the help of the government, outline the roles and responsibilities of each agency and include the details in the community-level pandemic plan, which will hopefully lay the foundation for a cohesive and effective pandemic response.

4.4.3 Increase human resources

In these northern remote and isolated communities, nurses work in an expanded role as they are the main providers of health care services (Tsuji, 1998). Literature has shown that geographically isolated First Nation communities under normal circumstances suffer from shortages of trained health care professionals, particularly nurses, and are typically forced to rely on relief staff which can have negative effects on health care services (MacMillan et al., 1996; Minore et al., 2005; Minore, Boone, & Hill, 2004). During a public health emergency, such as an influenza pandemic, human resources will play a central role in the response and will be required to implement various pharmaceutical interventions and provide medical care for patients (Ives et al., 2009; Oshitani et al., 2008). However, in an influenza pandemic, staff shortages may be exacerbated by various reasons, such as falling ill oneself, transportation challenges, childcare/family obligations, and fear of exposure to name a few (Hampton, 2007; Ives et al., 2009; Wilson, Baker, Crampton, & Mansoor, 2005).

Health Canada's FNIHB is responsible for providing health care services to on-reserve First Nation communities and should continue to prioritize recruiting a full-time, permanent complement of nurses (CPIPHS, 2006). To aide in retaining nursing staff, recruited nurses should be provided with a proper orientation to prepare them for the demanding nature of the job

and to learn about the importance of respecting First Nations' traditional values (Minore et al., 2005; AFN, 2007). During an influenza pandemic, some broad strategies can be implemented to mitigate the effects on health care personnel, such as establishing designated clinics for patients with influenza-like illness symptoms and improving the surge capacity of health sector (Wilson et al., 2005). A participant also suggested that during a public health emergency pre-approved vacation time should be postponed or cancelled to optimize the number of health care personnel. Furthermore, as suggested by participants, plans should be developed to deploy an interdisciplinary team of health care professionals with the expertise to deal with a public health emergency, such as communicable disease nurses and psychological support.

4.5 Conclusion

Remote and isolated First Nation communities are unique in that multiple government bodies share responsibility for the health of their community members during a public health emergency. This qualitative study presents an insight into the barriers that arose during the pandemic response of three communities possibly due to the dichotomy (or trichotomy) between government bodies and suggests recommendations which can be incorporated into future pandemic plans. While progress has been made, it is hoped that via formal communication and collaboration, the aforementioned issues will be addressed and will lead to an improved and coordinated health care delivery in First Nation communities during a public health emergency.

CHAPTER 5: THE EVOLUTION OF COMMUNITY-LEVEL PANDEMIC PLANS (KNOWLEDGE TRANSLATION)

5.0 Introduction

The literature review (i.e., chapter two) and the results of chapters three and four indicated that the three remote and isolated First Nation study communities (i.e., Fort Albany, Attawapiskat, and Kashechewan) can improve their pandemic response by including community-based input into future community-level pandemic plans. This chapter presents the knowledge translation or "linking research to action" component of this endeavour. More specifically, this chapter describes how the qualitative research findings were directly applied to modify community-level pandemic plans to meet each community's specific needs. The evolutionary stages of each study community's community-level pandemic plan are described.

5.0.1 Knowledge Translation

There has been a growing concern that research findings are not being optimally and promptly utilized to change current practice methods (Graham et al., 2006). A WHO report states that it is important to enhance the knowledge translation (KT) process by directly linking research results to action (WHO, 2004; Majdzadeh, Nedjat, Denis, Yazdizadeh, & Gholami, 2010; Graham et al., 2006). The knowledge-to-action process encompasses both knowledge creation and knowledge action (Canadian Institutes of Health Research (CIHR), 2010; Graham et al., 2006). Knowledge creation is the process by which knowledge becomes more refined and relevant to the stakeholders. For instance, at each phase of knowledge creation, the researchers can adapt the research to meet the needs of the knowledge-user (CIHR, 2010; Graham et al., 2006). Knowledge action is the cycle which represents how the knowledge is implemented and applied (CIHR, 2010; Graham et al., 2006). In Canada, the Canadian Institutes of Health Research, defines the term knowledge translation as, "a dynamic and iterative process that includes synthesis, dissemination, exchange and ethically-sound application of knowledge to improve the health of Canadians, provide more effective health services and products and strengthen the health care system" (CIHR, 2010).

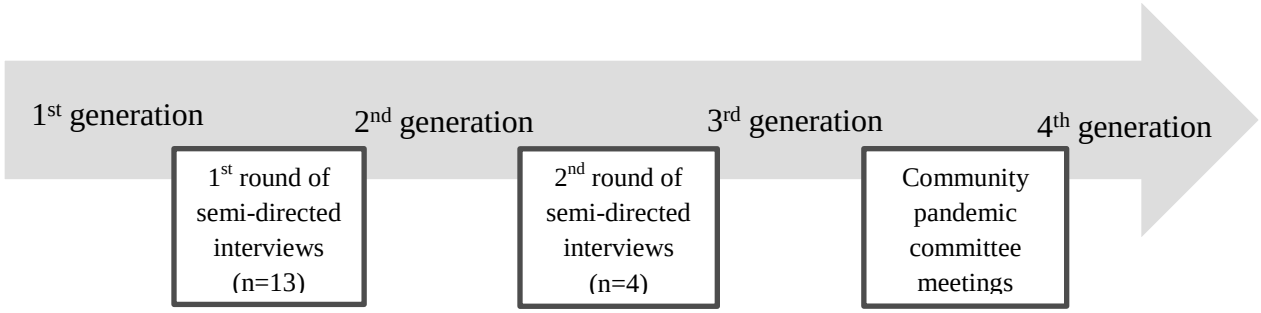
5.0.2 Objective

The main objective of my research endeavour was to engage the end users in the research process by collecting qualitative community-based data to inform modifications to community-level pandemic plans. These modified community-level pandemic plans will hopefully lead to an improved pandemic response capacity and improve health outcomes during the next public health emergency.

5.1 Methodology

Each study community had a pandemic plan in place during the 2009 H1N1 pandemic, which will be referred to as the 1st generation community-level pandemic plan (brief details are included in chapter two). Via two rounds of semi-directed interviews and one community pandemic committee meeting per First Nation, qualitative data were collected to inform modifications to each study community's 1st generation community-level pandemic plan (Figure 2). Each subsequent version of the community-level pandemic plan was orally validated by community members.

Figure 2. Stages of modifying community-level pandemic plans for the three participating First Nations



The first round of semi-directed interviews was conducted during the period from February 9 to 23, 2010 with 13 adult key informants (details included in chapters three and four). Collected qualitative data were used to inform modifications resulting in a 2nd generation community-level pandemic plan for each study community. The 2nd generation community-level pandemic plans included colour coded modifications suggested by community members responsible for the health sector pandemic response from their respective community and the other two participating

communities. This method was employed since all communities share similar living conditions; therefore, other communities' suggestions may be relevant and desired. Suggested modifications to the 2nd generation community-level pandemic plans were also ascertained from relevant academic literatures (details included in chapter two).

The second round of semi-directed interviews was conducted during the period from May 31 to June 10, 2010 with the health director/supervisor of each study community's health center. In Attawapiskat, the nurse-in-charge also attended. The health director/supervisor was chosen since he/she assumes a lead role during a pandemic response and is mainly responsible for community health. During the semi-directed interview, participants were given their respective 2nd generation community-level pandemic plan and asked to validate its contents. Each page of the plan was reviewed with the participant thereby giving him/her an opportunity to comment on all aspects of plan. Specific questions were also asked to gain more detail about some aspects of the pandemic plan. Desired modifications resulted in the 3rd generation community-level pandemic plan.

The 3rd generation community-level pandemic plan was subsequently presented to the study community's pandemic committee during the period from July 27 to August 13, 2010. As mentioned, eight to ten representatives from various sectors involved in the community's pandemic response attended, including Band Council, health center, hospital wing, education, clergy, Northern store, water treatment plant, and emergency medical services. Proposed modifications from each community pandemic committee meeting resulted in the 4th generation community-level pandemic plan. At the request of the community, multiple copies of this version were made and presented. Additionally, a representative from the Band Council (i.e., Chief) and health center (i.e., health director/supervisor) were given digital versatile discs (DVD) of their respective community-level pandemic plan. This allows the dynamic pandemic plan to be accessed and changed accordingly to the community's future needs.

5.2 Results

5.2.1 2nd Generation Community-Level Pandemic Plan

As mentioned, the 2nd generation community-level pandemic plans included colour coded modifications suggested by participants of all study communities during the 1st round of semi-

directed interviews and relevant academic literatures. Note in Fort Albany, the existing FAFNPP and PHSPP were amalgamated to reduce redundancies and create one cohesive pandemic plan.

Primary modification made which resulted in the 2nd generation community-level pandemic plan, included:

- Updated names and contact information of community pandemic committee members.
- Added emergency phone numbers and a list of abbreviations.
- Specific detail was added about the surveillance system, mass immunization clinic protocol, ILI screening, home support program, planning for acute patients, and community infection control measures (CICM).
- "Supplies" was added as a section in each phase (i.e., pre-pandemic, pandemic, post-pandemic), consistent with it being an emerging code from the data. The supplies section included details about ordering and providing supplies, a list of pandemic influenza supplies, and formulas for ordering pandemic influenza supplies.
- Specifically in AFNPP, post-pandemic phase sections (i.e., surveillance, vaccine, antivirals and antibiotics, health services, supplies, emergency response, public health measures) were added as these sections were omitted in the 1st generation community-level pandemic plan.
- Specifically in KFNPP, one post-pandemic phase section (i.e., antivirals and antibiotics) was added as it was omitted in the 1st generation community-level pandemic plan.

5.2.2 3rd Generation Community-Level Pandemic Plan

Primary modifications suggested by health directors/supervisors which resulted in the 3rd generation community-level pandemic plan included:

- Updated names and contact information of community pandemic committee members.
- Removed "Tasks to be completed" column of each section of each phase.
- Specific detail was added about the surveillance system and ordering, storing, and distributing antivirals.
- Added Appendices section which included sixteen appendices with detailed information:

- WHO Pandemic Influenza Phases, Canadian Activity Level, Mass Immunization Clinic Protocol, PHAC: Mass Immunization Clinics in Remote & Isolated Communities (website link), Human Resource Contingency Plans, List of Essential Services, Alternate Care Site Plan, Outbreak Control Team (and Clinical Pandemic Response Group) (named Command Center in KFNPP), List of Pandemic Influenza Supplies, FNIHB Formulas for Pandemic Influenza Supplies, Community Emergency Preparedness and Response Plan, Corpse Storage and Temporary Morgue Plan, Community Infection Control Measures, Templates for Community Notices, Communication Plan, Helpful Resources (website links)

5.2.3 4th Generation Community-Level Pandemic Plan

After the community pandemic committee meetings, some minor wording changes were made throughout the pandemic plans resulting in the 4th generation community-level pandemic plans (Charania et al., 2010a; Charania et al., 2010b; Charania et al., 2010c). Primary modifications included:

- Updated names and contact information of community pandemic committee members.
- In the FAFNPP and AFNPP, a statement about having the health care staff properly fitted for N95 masks was added in the "Supplies" section of each phase.
- In the KFNPP, a statement about the local store having disinfectant wipes available was added to the "Supplies" section of the pandemic phase.
- Noteworthy changes to Appendices section:
  - Mass Immunization Clinic Protocol
    - In the KFNPP, a protocol specifically developed for Kashechewan First Nation by a local Registered Nurse was included.
  - Alternate Care Site Plan
    - In the FAFNPP and AFNPP, specific information regarding the organizers, location, and special considerations was added.
  - Corpse Storage and Temporary Morgue Plan
    - In the FAFNPP, AFNPP and KFNPP, location options for a temporary morgue in summer and winter scenarios were added.

5.3 Conclusion

In summary, most changes to the community-level pandemic plans involved adding specific detail, including clarifying roles and responsibilities of each organization. Although many updates were made, some areas still require modifications. For instance, human resource contingency plans for each workplace in the community should be included in the community-level pandemic plan. Moreover, after further debriefing with the community pandemic committee, additional detail should be included in the alternate care site plan, the community emergency preparedness and response plan, and the corpse storage and temporary morgue plan. Furthermore, the community infection control measures should be revised according to the recent research evidence base, specifically with regards to what measures are effective at mitigating a pandemic in remote and isolated communities.

These community-level pandemic plans are dynamic; therefore, it is anticipated that in the future these plans will be re-assessed and further modified to meet the evolving needs of each community hopefully leading to an improved pandemic response.

CHAPTER 6: CONCLUSION AND FUTURE RESEARCH

This chapter outlines the main implications of the two papers and the knowledge translation aspect of this research. The objective of this research was to gain insight into the health sector pandemic response of three remote and isolated First Nation communities, since research has shown that disadvantaged groups may be disproportionately impacted by public health emergencies.

Issues that arose regarding the study communities' 2009 H1N1 pandemic response appeared to stem either from the geographical remoteness of the communities or because health care in First Nation communities is uniquely governed. Chapter three outlined the primary barriers which impacted the remote and isolated communities, including issues with overcrowding in houses, insufficient human resources, and inadequate community awareness. Chapter four outlined the barriers faced in the study communities due to the existing dichotomy (or trichotomy) between the government bodies responsible for the delivery of health care, including receiving contradicting guidelines and direction, sufficient information sharing, and lack of specific details in community-level pandemic plans. The findings of this research indicate that more attention must be focused to ensure remote and isolated First Nation communities' concerns are addressed in the future. Effort should be directed towards developing plans to provide funding, supplies, and human resources as needed when responding to a public health emergency. Additionally, funding needs to be directed to improve the living conditions currently experienced in most First Nation communities. Furthermore, it is recommended that improvements be made to improve the health care delivery capabilities, specifically regarding equipment and human resources, in geographically remote communities to better prepare them for the next public health emergency. Moreover, increased formal communication and collaboration should occur between responsible government bodies to clarify roles and responsibilities during an influenza pandemic.

Findings of this research were also used to modify community-level pandemic plans, thereby linking research to action. Chapter five described the various changes to the communities' pandemic plans, most of which involved adding specific detail. Therefore, it is recommended that all federal and provincial pandemic plans add specific detail which will facilitate an improved pandemic response since people will be identified and responsible for certain actions. As the plans are "living documents", it is anticipated that after the next public health emergency,

the pandemic response will be re-assessed for barriers and possible solutions resulting in further modifications to the plans as part of the knowledge action process.

Future research should be directed towards finding and implementing solutions to improve the sharing of health information between responsible government bodies in remote and isolated First Nation communities. In addition, empirical research should be conducted to discover which non-pharmaceutical measures are effective in mitigating an influenza pandemic in remote and isolated First Nation communities, which can be included in future community-level pandemic plans.

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