An Analysis of Healthcare Worker Attitudes & Barriers to Influenza Vaccination

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Thesis submitted to the
Faculty of Graduate and Postdoctoral Studies
In partial fulfillment of the requirements for the MSc degree in Epidemiology

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September 20, 2012

An Analysis of Healthcare Worker Attitudes & Barriers to Influenza Vaccination

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Abstract

Influenza is a major concern across healthcare environments. Annual vaccination of healthcare workers (HCWs) remains essential for maintaining the health and availability of HCWs, as well as influenza prevention in healthcare environments. Yet, annual vaccination coverage among HCWs continues to be below recommended standards during pandemic (pH1N1) and non-pandemic (sINFLU) influenza seasons. The primary aim of this research is to inform the design and implementation of effective HCW targeted influenza vaccination campaigns via a 1) systematic review of the existing literature on HCW pH1N1 vaccination, 2) qualitative content analysis of motivators and barriers to HCW pH1N1 and sINFLU vaccination, as well as 3) quantitative regression analysis of modifiable factors predicting pH1N1 and sINFLU vaccination. The qualitative and quantitative analysis processes were applied to data collected from a large-scale multi-professional sample of HCWs.

Findings from all analysis sections were found to be consistent. Most attitudes, beliefs, motivators, and barriers influencing HCW influenza vaccination were similar for pH1N1 and sINFLU vaccinations. Yet, a number of notable differences were also identified. HCWs were likely to accept vaccination if they perceived, 1) vaccination to be safe, 2) vaccination to be protective against influenza for self, loved ones, patients or communities, and 3) influenza to be a serious and severe infection to self and others. Additionally, encouragement from supervisors and colleagues, physicians, and loves ones also enhanced vaccine uptake. Most HCWs avoided vaccination because of 1) limited knowledge or misinformation about vaccination, 2) concern for vaccine induced side-effects and 3) assuming vaccination was not a requirement for healthy adults. With respect to pH1N1 vaccination, mass media communications, perceptions of novel vaccinations, and rapid vaccine development processes especially deterred HCW pH1N1 vaccination.

Future vaccination programs targeting HCWs should look towards influencing HCWs' vaccination attitudes and promoting pro-vaccination cultures in healthcare workplaces.

Acknowledgments

I would like to express my heartfelt gratitude to my thesis supervisors and committee members for providing me the opportunity to pursue this project, this thesis was possible because of their guidance and support. Dr. Rama C. Nair, Dr. Gary Garber, Dr. Kimberly Corace, and Dr. Anne E. McCarthy have all played an integral role in my development as a scientific researcher and an Epidemiologist. I would like to take this opportunity to especially thank Dr. Kimberly Corace for her support, and for always going over and beyond what was required to support me as a graduate student and as her employee.

I would also like acknowledge the Canadian Institute of Health Research (CIHR) Institute of Population and Public Health (IPPH) and the Institute of Gender and Health (IGH), Health Systems Research on H1N1 Operating Grant, for their financial support, which made this project possible.

Lastly, I would like to sincerely thank my husband and family for their encouragement and support during this academic pursuit, without them my accomplishments mean nothing.

Contribution of authors

This report is my master's thesis submitted to the University of Ottawa in partial fulfilment of the requirements of the MSc degree in Epidemiology.

This thesis is based on a research project on which I was the research coordinator and the majority of work was performed by me, under the guidance and supervision of my thesis committee as well as others. The results, specially the published and submitted papers, acknowledge this by the authorship of the papers. In my role as the research coordinator for the Optimizing H1N1 Vaccination Uptake among Healthcare Workers Study (HCW-pH1N1 Study), I have contributed to the conception and design of the study, played a lead role in the acquisition of data, and conducted the analysis and interpretation of data discussed in this report. All manuscripts included in this report have been drafted by me and critically revised by manuscript co-authors and thesis committee members. Finally, I have received approval from Elsevier Limited (publisher) to use the published manuscript, **Prematunge C**, et al., Factors influencing pandemic influenza vaccination of healthcare workers- A Systematic Review (Published in Vaccine. 2012 Jul 6;30(32):4733-43. Epub 2012 May 27), in this thesis report.

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1.0. Background

1.1. Epidemiology of influenza in healthcare settings

Seasonal influenza (sINFLU) is the most common cause of acute respiratory illness worldwide. [1] The World Health Organization reports that 5-15% of the entire world's population is annually affected by influenza annually, leading to 3-5 million severe cases and 250,000-500,000 deaths each year.[1] According to US data, sINFLU causes an average of 31.4 million outpatient visits and 3.1 million hospital days leading to $10.4 billion in direct medical costs and $87.1 billion in total economic burden.[2] Similar estimates of healthcare and economic burden have also been reported by other industrialized nations world-wide.[3-5]

In Canada influenza tends to be a seasonal infection, typically occurring during the fall and winter months. Although most influenza infections follow influenza trends within the community, the mode and source of infections tend to be varied and unknown.[6] Since the virus can be transferred through multiple modes of infection, such as direct contact, viral secretion, droplet exposure and fomites, it makes it difficult to track influenza infections in many settings, including healthcare facilities.[6] Infections among healthy adults are often sub-clinical leading to infection transfer in the absence of symptom presentation.[4,7]As a result most patients and staff in healthcare settings can become potential vectors and reservoirs of influenza infections.[5, 8-11] Annual vaccination of such persons against influenza is found to be the most effective mode of infection prevention.[5, 8-13]

1.2. Influenza vaccination of HCWs

Influenza vaccination of healthcare workers (HCWs) is an established method of infection control in healthcare settings.[5,8-14] Influenza vaccination is proven to reduce occupational exposure and sick leave among HCW staff, decrease infection transmission to at risk patient populations, and reduce the significant financial costs associated with the

management of influenza in healthcare.[5,8-14] For instance, a single influenza outbreak in an internal medicine ward of an acute care hospital is reported to have led to delays in patient admissions, increased HCW absenteeism, and $34,000 in additional patient management costs.[15] As such, vaccination of HCW staff is also a cost effective mode of infection prevention among HCWs and patients.[15]

Influenza prevention across healthcare settings is especially important because persons at increased risk of influenza complications, such as the elderly and immune-compromised, are overrepresented in hospital patient cohorts.[5, 8-14] Furthermore, the vaccine is found to be most efficacious among those with least risk of influenza complications and least efficacious among those at increased risk of infection related complications.[4,7] Thus, the vaccine is highly efficacious (70%-90%) in healthy adults such as HCWs, but vaccine efficacy in the elderly and the immune-compromised is significantly lower.[4,7] As a result, enhanced vaccine coverage among HCWs not only prevents influenza and absenteeism among staff it also provides additional protection to patients at increased risk of influenza complications via indirect immunity.[5, 9, 10] Although Canada's National Advisory Committee on Immunization and similar authorities call for approximately 70-90% vaccine coverage[12,13], rates reported by healthcare organizations range from 5% to 100%, and many institutions consistently report HCW vaccination rates well below the 70-90% recommended targets every influenza season.[5, 9, 10, 14, 16]

1.3. Pandemic influenza (pH1N1) vaccination of HCWs

In June 2009, a novel strain of influenza (H1N1) spread across the globe resulting in the first influenza pandemic of the 21st century. The prioritized vaccination of HCWs was determined to be a key strategy of the pandemic H1N1 (pH1N1) preparedness process.[17-19] In fact, pandemic preparedness guidelines set forth by the World Health Organization (WHO)

identified rapid vaccination of HCWs to be essential for pH1N1 outbreak management and healthcare response activities.[17] These pandemic preparedness guidelines went on to direct pandemic response measures across the globe, which resulted in many countries adopting prioritized pH1N1 vaccination of HCWs into national pH1N1 response processess.[17-19]

1.4. The Ottawa Hospital (TOH) pH1N1 vaccine campaign

The prioritized vaccination of HCWs was a key feature of the Canadian pH1N1 response process.[20] In the fall of 2009, at the onset of the 2009/2010 influenza season, mass immunization campaigns were launched across the country by Canadian provincial and territorial health authorities.[20] In accordance with the national pH1N1 response plan, a mass immunization campaign targeting all hospital staff was launched at a large tertiary care Hospital (TOH) in Ontario, Canada, in October 2009. This campaign incorporated various strategies to enhance staff immunization, which included a highly visible communication strategies, weekend immunization clinics accommodating staff family vaccinations, extended vaccination clinic hours, roving vaccine carts, along with hospital management and administration leadership.

The Occupational Health and Safety (OCHS) departments of the hospital collected and compiled information on employee pH1N1 vaccination. According to OCHS records, by the completion of the hospital's 2009/2010 pH1N1 influenza immunization campaign more than 71% of staff had received the pH1N1 vaccine. A vaccine coverage rate of 71.6% was especially remarkable because such a high proportion of vaccine uptake was never before observed in this HCW population. In fact, vaccine uptake during the influenza pandemic demonstrated a significant increase from the hospital's previous at best influenza vaccine coverage rate of 45%. The higher than average pH1N1 vaccine coverage suggests most HCWs at TOH reacted positively to this vaccine campaign and that many HCWs who had

typically not become vaccinated against influenza during previous influenza seasons opted to receive the pH1N1 vaccine. However, the observed vaccine coverage rate of 72% also meant that 28% of HCWs still remained unvaccinated against pH1N1 vaccine midst of an influenza pandemic. This group of HCWs continued to be unvaccinated despite a pandemic infection and a highly visible global vaccination strategy, both of which garnered a great deal of attention. These non-vaccinated HCWs may represent a group of HCWs who are "conscientious objectors" to flu vaccines, who act as a negative marketing force to combat pro-vaccination strategies of the institution and discourage fellow HCWs from becoming vaccinated. Therefore, it is equally important to investigate HCW non-vaccination behaviour during pH1N1 vaccination campaign.

The previously unobserved increase in vaccine coverage during pH1N1 became a best-case scenario for understanding HCW influenza vaccination behaviour. Better understanding the fundamental reasons why HCWs either accepted or did not accept pH1N1 vaccination in the midst of an aggressive immunization campaign, and the media hype surrounding pH1N1 will help in the design and development more successful influenza vaccination programs and policies.

1.5. Optimizing H1N1 Vaccination Uptake among Healthcare Workers Study (HCW-pH1N1 Study)

The Optimizing H1N1 Vaccination Uptake among Healthcare Workers study (HCW-pH1N1 study) led by Anne McCarthy, Gary Garber, and Kim Corace of the Ottawa Hospital (TOH) investigated HCW vaccination coverage during the 2009/2010 influenza vaccination campaign. The objective of this study (funded by the Canadian Institutes of Health Research (CIHR)), was to identify factors influencing HCW pH1N1 and 2008/2009 seasonal influenza vaccine uptake, in order to improve influenza prevention infrastructure and best

practices of HCW influenza vaccination campaigns and thereby enhance HCW vaccine coverage. The findings of the study were intended to inform the design and implementation of effective vaccine campaigns that appropriately address influenza vaccine attitudes and barriers among HCWs. I served as the study coordinator for this observational study.

Study Site: The study was conducted at the Ottawa Hospital, located in Ontario Canada. The hospital is a bilingual institution, which is also one of the largest tertiary care hospitals in Canada

Study Procedure(s): Following Ottawa Hospital Research Ethics Board approval (TOH-REB protocol # 2010156-01H), a survey questionnaire with uniquely identifiable ID numbers was mailed out to ALL active employees of the healthcare institution, in July 2010. The study package included a letter inviting staff to participate in the bilingual study, an informed consent and information form, a questionnaire package, and a stamped, self-addressed return envelope. All hospital staff was encouraged to participate in the study by completing and returning the questionnaire to the hospital's Occupational Health and Safety (OCHS) department by the response deadline (July 30th, 2010). OCHS collected the questionnaires and de-identified them, so that only de-identified responses were analyzed by the research team.

The OCHS department of the hospital had compiled information on staff vaccination during the 2009/2010 influenza season, and housed a list of employees who did and did not receive pH1N1 vaccination during the pH1N1 immunization campaign. OCHS records were used to verify the self-reported pH1N1 vaccination status of HCW survey respondents. It is important to note this matching process was done using de-identified electronic databases in order to maintain employee confidentiality and study participant anonymity.

Study Population: All individuals employed at TOH were considered HCWs, which included HCWs providing direct patient care and persons who indirectly supported various health services offered by the facility. All staff at all campuses of TOH were eligible to participate in the survey and the final study population included both HCWs with direct patient contact (i.e. nurses, physicians, and allied healthcare professionals) and HCWs without direct patient contact (i.e. administration, research and laboratory personnel, healthcare technicians, logistic and facility services employees). Thus, the study sample consisted of a large-scale multi-professional sample of HCWs.

Study Questionnaire: The study questionnaire was based on a review of the then existing literature and was developed in collaboration with specialists in infection prevention and control, behavioural psychology and infectious diseases *(refer to Appendix section A1 for a copy of the survey).*

The HCW-pH1N1 study questionnaire package contained measures in,

- **Socio-demographics,** including age, gender, race, occupation, marital status, TOH campus/site of employment, and perceived health status.
- **Seasonal Flu Vaccine History (self report):** This 8 item measure on HCWs' influenza vaccination history, allergies to vaccine components, as well as experiences with prior immunizations.
- **pH1N1 Vaccine Attitudes and Knowledge Scale:** A 34 item scale adapted from questionnaires developed to measure behavioural determinants associated with influenza vaccine uptake among HCWs.[21, 30] The scale surveyed the 5 constructs of the Health Beliefs Model (HBM)[27] as well as general attitudes of HCWs

towards pH1N1 vaccination. Participants were asked to indicate the extent to which they agree or disagree with each scale item on a 5-point Likert scale.

- **Seasonal Influenza Vaccine Attitudes and Knowledge Scale:** A 34 item scale that contained items similar to the pH1N1 Vaccine Attitudes and Knowledge Scale (described above), but asked participants to the extent to which they agree with statements about sINFLU vaccination.
- **Reasons for Vaccine Uptake**: An open-ended qualitative questionnaire, asks HCWs to state and rank their TOP three reasons for receiving the pH1N1 and/or sINFLU vaccines.
- **Reasons for Vaccine Avoidance:** An open-ended qualitative questionnaire, asks participants to report and rank order their reasons for avoiding the pH1N1 and/or sINFLU vaccines.
- **pH1N1 Client Satisfaction Questionnaire:** 9-item scale based on the validated Client Satisfaction Questionnaire (CSQ). Items from the original CSQ were modified to more accurately reflect pH1N1-specific heath care services.

Study Sample: A total of 10,464 eligible survey packages were mailed-out to staff (i.e. HCWs) at TOH, and 3,382 (32.4% response rate) completed surveys packages were returned to the OCHS department by the response deadline.

Ethics: All aspects of the study were approved by the Ottawa Hospital Research Ethics Board (TOH-REB protocol # 2010156-01H, *refer to Appendix section A2 for a copy of the REB approval letter for the study*).

1.6. The Health Belief Model (HBM)

The pH1N1 Vaccine Attitudes and Knowledge Scale and the Seasonal Influenza Vaccine Attitudes and Knowledge Scale items were based on the 5 constructs of the HBM, so that modifiable attitudes and beliefs of HCW towards influenza vaccination could be better examined.

Theories of health behaviour offer researchers a valid method for understanding attitudes and beliefs driving various health behaviours, including vaccination and non-vacciantion.[21-26] A more in-depth understanding of modifiable attitudes and beliefs directing vaccination can offer a starting point for influencing HCW vaccination behaviour and behavior change, which could be directly applied to the development of future vaccination programs.[21-23, 25] As such, the HCW-pH1N1 study intended to focus on the investigation of modifiable HCW attitudes and beliefs towards influenza vaccination using a valid theory of health behaviour as an explanatory framework.

A literature review of sINFLU vaccination behaviour, conducted during HCW-pH1N1 study's design phase, found the Health Belief Model (Figure 1) to be a valid theoretical framework, applicable to this type of research.[27]

The HBM, which was originally developed to explain patient participation in preventative health behaviour, has also been applied to HCW sINFLU vaccination behaviour, suggesting this theory may also explain HCW pH1N1 vaccination in pandemic settings.[24, 26, 27] Thus, the HCW-pH1N1 study focused on the investigation of HCW attitudes, beliefs, and knowledge towards influenza using questionnaire items derived from the HBM.

The HBM is a value-expectancy theory which states, an individual's desire to prevent or avoid illness through engagement in a recommended health behaviour is linked to that individual's confidence in that health behaviour's ability to prevent the illness in question.[24,

[26, 27] Therefore, according to the HBM, influenza vaccine behaviour can be understood by way of 5 key constructs:

(1) **perceived susceptibility to influenza**

(2) **perceived severity of influenza**

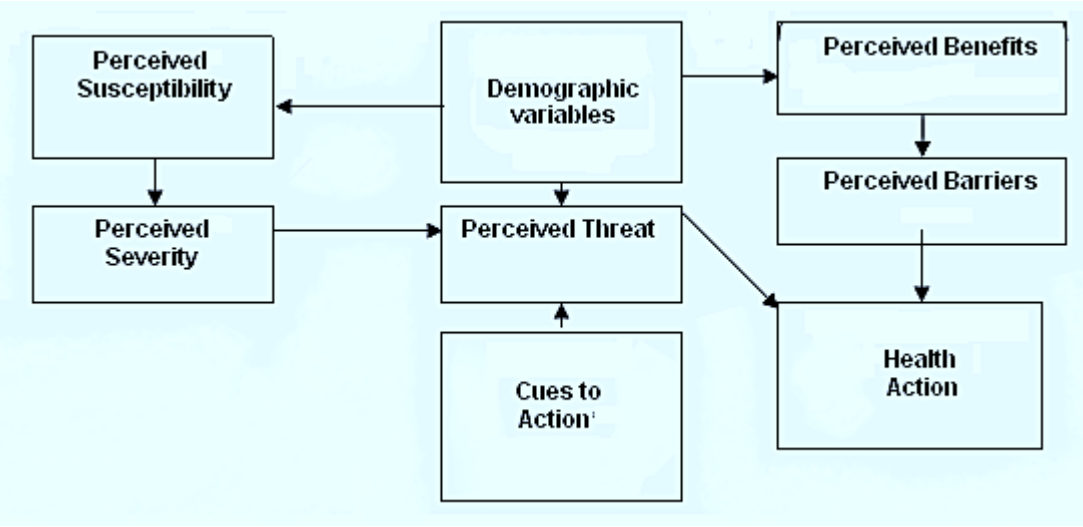
(3) **perceived benefits of vaccination in preventing influenza**

(4) **perceived barriers to accepting vaccination**, and

(5) **cues to action** (i.e., internal and external stimuli that serve as motivators for vaccine uptake).

Based on the HBM, HCW would become vaccinated (i.e. health action) against influenza (i.e. perceived threat) if they viewed influenza to be a susceptible and severe infection, believed the benefits of vaccination would outweigh barriers to vaccination, and were motivated by positive cues to action. The association between HBM constructs and a desired health action (e.g. vaccination) is summarised in Figure 1.1.

Figure 1.1: The Health Belief Model



Adapted from Rosenstock et al., 1974

2.0. Thesis overview

2.1. Goals & objectives

The goal of this thesis is to inform the design and implementation of effective influenza vaccination campaigns that increase HCW vaccine coverage via a systematic review of the current literature and an in-depth analysis of data collected by the aforementioned HCW-pH1N1 study. This thesis however, does not examine or comment on nosocomial influenza outbreaks. The investigation of various factors that influenced HCW influenza vaccination during pH1N1 is meant to provide insight into HCW vaccination behaviours and inform the primary research question: **Why do HCWs receive or not receive influenza vaccination during an influenza pandemic, specifically pH1N1?** In addition to pH1N1 vaccination behaviour, this study also focuses on an analysis of factors influencing HCW vaccination in non-pandemic scenarios, such as the 2008/2009 sINFLU season. Therefore the secondary question of this research is: **Why do HCWs receive or not receive sINFLU vaccination during non-pandemic influenza seasons?**

Understanding the set of reasons influencing a HCW to either receive or not receive influenza vaccination during an influenza pandemic, as well as during non-pandemic influenza seasons, can be important when establishing vaccine guidelines and developing effective immunization campaigns.

This thesis focuses on the following key objectives:

1. **Identify, from current literature, the range of factors motivating HCWs to receive and/or not receive pH1N1 vaccination**
2. **Capture key themes and rationales directing HCW decisions towards pH1N1 and sINFLU vaccination and non-vaccination**

3. **Explain the relationship(s) between key barriers and motivators towards pH1N1 and sINFLU vaccination among HCWs in pandemic and non-pandemic scenarios**

The goals and objectives of this thesis study are consistent with those of the HCW-pH1N1 study. Both studies focus on enhancing HCW influenza vaccine coverage to recommended targets. Thus, the overall aim of this research is to provide information for the development of HCW influenza immunization strategies and direct research and policy in this area..

2.2. Study design

This research study employed the following three components to better understand HCW influenza vaccination:

1. **A systematic literature review of factors influencing HCW pH1N1 influenza vaccine uptake and refusal during the 2009/2010 pandemic**
2. **Qualitative analysis of HCW reported reasons for pH1N1 and 2008/2009 sINFLU vaccine uptake and avoidance using data collected by the HCW-pH1N1 study**
3. **Quantitative analysis of factors predictive of HCW pH1N1 and 2008/2009 influenza vaccination using data collected by the HCW-pH1N1 study**

2.3. Data analysis section overview

An overview of each analysis section of the thesis is provided below.

2.3.1 - Systematic literature review of factors influencing HCW pH1N1 influenza vaccination and non-vaccination during the 2009/2010 pandemic

Objective: To identify factors 1) unique to HCW pandemic influenza vaccination and 2) similar to previous sINFLU vaccination research, using a valid and applicable theory of health behaviour (i.e. the Health Belief Model).

Rationale: pH1N1 provided researchers the opportunity to explore influenza vaccination when a specific group (i.e. HCWs) is targeted for rapid immunization during a pandemic, and a number of studies have investigated and reported on various factors that influenced HCW pH1N1 immunization behaviour. Although numerous publications have reported on various reasons, attitudes, beliefs, knowledge gaps, and predictors relating to HCW pH1N1 vaccination, no formal review of this literature presently exists. Therefore, this systematic review examines key factors reported to have influenced pandemic influenza immunization among HCWs from different geographic regions during the 2009/2010 influenza pandemic.

Methods: A comprehensive review of HCW pH1N1 vaccination literature (MEDLINE, PubMed, EMBASE, PsycINFO, CINHAL, AMED, Cochrane Library, ProQuest, and grey literature sources) published between January, 2005 and December, 2011, was conducted. Factors reported to be influential in HCW pH1N1 vaccine uptake and refusals were coded into the appropriate HBM constructs.

Implications: This systematic review aims to enrich the current body of scientific literature on HCW pH1N1vacciantion, and thereby inform the design and development of future influenza campaigns and pandemic planning processes

2.3.2 - Qualitative analysis of HCW reported reasons for pH1N1 and 2008/2009 sINFLU vaccination (data collected by the HCW-pH1N1 study)

The analysis of qualitative data may provide additional insight into why HCWs choose to receive or to not receive influenza vaccination, independent of quantitative analysis. Based on this rationale, the *HCW-pH1N1 study* collected qualitative information on motivators and barriers influencing HCW vaccination behaviours from a multi-professional sample of HCWs.

Objective: To present a qualitative account of HCW reported motivators and barriers having an impact on influenza vaccination, in pandemic and non-pandemic settings.

Rationale: Much of the existing research on HCW pH1N1 vaccination focuses on the quantitative analysis of factors predictive of vaccination behaviour, and qualitative research in the area is limited. Qualitative research can provide information on HCW worldviews, values, perceptions, beliefs, rationales, and assumptions regarding vaccination to provide a more comprehensive picture of HCW influenza vaccination.

Methods: A content analysis TOP THREE qualitative reasons provided by the HCWs for 1) pH1N1 vaccine uptake and avoidance, and 2) 2008/2009 sINFLU vaccine uptake and avoidance. The systematic review (Part I) provided the basis for the development of the coding scheme of the content analysis.

Implications: The qualitative analysis of HCW reported vaccination barriers and motivators can lead to the development of vaccination campaigns and pandemic response processes that better promote key motivators and resolve key barriers to HCW influenza vaccination and resolve key vaccination barriers in HCW populations.

2.3.3 (Analysis A and B) - Quantitative analysis of factors predictive of HCW pH1N1 and 2008/2009 influenza vaccination (data collected by the HCW-pH1N1 study)

HCW-pH1N1 study surveyed a multi-professional sample of hospital based HCWs to establish HCW attitudes and beliefs towards pH1N1 and sINFLU vaccines by applying the HBM framework. Information regarding key socio-demographics, influenza risk factors and past vaccination history was also collected from the study sample. The analysis of this data can enhance our understanding of HCW influenza vaccination behaviours and better explain why HCWs chose to receive or not receive influenza vaccination.

Objectives: To examine the broad array of factors (including socio-demographic and modifiable HCW attitudes and beliefs) that predict actual pH1N1 and self-reported 2008/2009 sINFLU vaccination, through the application of the HBM framework and regression analysis. Also, to compare factors predictive of HCW influenza vaccination behaviour in pandemic and non-pandemic settings.

Rationale: Although researchers have previously reported on factors influencing HCW pH1N1 vaccination and non-vaccination, the majority of this research focuses on the intention to be vaccinated (as opposed to actual vaccination status) and neglects to investigate the impact of modifiable HCW attitudes and beliefs on vaccination and non-vaccination behaviour. Additionally, much of the existing research has focused specifically on sINFLU or pH1N1 vaccination separately, as opposed to comparing pandemic and non-pandemic vaccination in the same HCW sample. Therefore, the existing literature may be limited in its capacity to enhance our understanding of HCW influenza vaccination behaviours by learning from pH1N1 to inform future vaccination campaigns.

Methods:

Analysis A: Logistic regression based predictive modeling to identify statistically significant associations between key socio-demographics and modifiable HCW attitudes and beliefs towards actual pH1N1 vaccination. The modeling process was informed by the systematic review (Part I) findings and the modifiable HCWs attitudes and beliefs were derived from the HBM framework.

Analysis B: Logistic regression based predictive modeling to identify statistically significant associations between key socio-demographics and modifiable HCW attitudes and beliefs, with respect to self-reported non-pandemic sINFLU vaccination. The modeling process was informed by the existing literature and literature reviews on HCW sINFLU vaccination, while the modifiable HCW attitudes and beliefs were derived from the HBM framework. Compare modifiable HCW attitudes and beliefs influencing pH1N1 vaccination to those influencing sINFLU vaccinations.

Implications: The identification of modifiable factors predicting HCW vaccination in pandemic and non-pandemic settings can inform the future design and implementation of vaccination campaigns that effectively influence modifiable HCW attitudes and beliefs to promote behaviour change and improve HCW vaccine coverage.

2.4. Thesis outline

This thesis is presented in a manuscript based thesis format. Each analysis section is considered an independent analysis and presented as four stand-alone research manuscripts (Sections 3-6).Additionally, some of the data analysis sections have been adapted from manuscripts either published or submitted for publication consideration in peer reviewed journals.

Section 1 provides a background and introduction to the study, and **Section 2** offers an overview of the thesis project and briefly describes each data analysis section. **Section 3**

is a systematic literature review of factors influencing HCW pH1N1 influenza vaccination, **Section 4**, focuses on qualitative content analysis of HCW provided reasons for personal pH1N1 and sINFLU vaccination and non-vaccination decisions, **Section 5** investigates factors predictive of HCW pH1N1 vaccination during the 2009/2010 pandemic influenza season, and **Section 6** investigates factors predictive of 2008/2009 sINFLU vaccination. **Section 7** focuses on the comparison of factors predicting vaccination in pandemic and non-pandemic settings, as well as provides an overall discussion of the key findings, limitations, and implications of this research. Finally, **Section 8** provides recommendations for future influenza vaccination programs, based on the findings of this research.

2.5. Author's role in the HCW-pH1N1 Study

Although she was not one of the primary investigators of the HCW-pH1N1 study, the author of this thesis has been involved with the all stages of study, from concept to dissemination of study's findings. She was involved in the initial grant application and study questionnaire development processes, and once funding was secured, she took on the role of the study's research coordinator. As the HCW-pH1N1 coordinator, she played a key role in 1) liaising with TOH-OCHS and TOH-administration, 2) leading all data collection and data entry processes, 3) preforming data checking and data analysis activities, 4) drafting conference abstracts/posters, and 5) authoring manuscripts.

3.0. Factors influencing pandemic influenza vaccination of healthcare workers- A Systematic Review

(Adapted from manuscript Published in Vaccine. 2012 Jul 6;30(32):4733-43. Epub 2012 May 27)

3.1. Abstract

Introduction: Maintaining the health and availability of healthcare workers (HCWs) is an essential component of pandemic preparedness. A key to protecting HCWs during the H1N1 pandemic was influenza vaccination. Numerous researchers have reported on factors influencing H1N1 vaccination behaviour in various HCW groups. This systematic review aims to inform future influenza vaccine interventions and pandemic planning processes via the examination of literature in HCW H1N1 vaccination, in order to identify factors that are (1) unique to pandemic influenza vaccination and (2) similar to seasonal influenza vaccination research.

Methods: We conducted a comprehensive review of literature (MEDLINE, PubMed, EMBASE, PsycINFO, CINHAL, AMED, Cochrane Library, ProQuest, and grey literature sources) published between January 2005 and December 2011 to identify studies relevant to HCW pH1N1 vaccine uptake/refusal (i.e vaccination/non-vaccination)

Results: 20 publications sampling HCWs from different geographic regions are included in this review. H1N1 vaccine coverage was found to be variable (9-92%) across HCW populations, and self-reported vaccine status was the most frequently utilized predictor of pandemic vaccination. HCW were likely to accept the H1N1 vaccine if they perceived, (1) the H1N1 vaccine to be safe, (2) H1N1 vaccination to be effective in preventing infection to self and others (i.e. loved ones, co-workers and patients), and (3) H1N1 was a serious and severe infection. Positive cues to action, such as the access of scientific literature, trust in public health communications and messaging, and encouragement from loved ones,

physicians and co-workers were also found to influence HCW H1N1 uptake. Previous seasonal influenza vaccination was found to be an important socio-demographic predictor of HCW vaccination. Factors unique to HCW pandemic vaccine behaviour are (1) lack of time and vaccine access related barriers to vaccination, (2) perceptions of novel and rapid pandemic vaccine formulation, and (3) the strong role of mass media on vaccine uptake.

Conclusion: Many of the factors that influenced HCW pandemic vaccination decisions have previously been reported in seasonal influenza vaccination literature, but some factors were unique to pandemic vaccination. Future influenza vaccine campaigns should emphasize the benefits of vaccination and highlight positive cues to vaccination, while addressing vaccination barriers in order to improve vaccine coverage among HCW populations. Since pandemic vaccination factors tend be similar among different HCW groups, successful pandemic vaccination strategies may be effective across numerous HCW populations in pandemic scenarios

3.2. Introduction

Vaccination of healthcare workers (HCWs) against influenza is an established mode of infection control in healthcare settings.[9,12,14,16] The immunization of HCWs against H1N1 was especially important during the 2009/2010 influenza pandemic.[19,28] At pandemic onset, the World Health Organization (WHO) recommended the prioritized and rapid immunization of HCWs against the influenza strain H1N1 as a means of protecting the integrity of health-care systems and national infrastructure.[17,18] Health authorities of many countries adopted WHO recommendations and the prioritized immunization of HCWs against pandemic H1N1 (pH1N1) was decided to be an integral component of pandemic preparedness processes throughout the globe.[17,18,28]

pH1N1 provided researchers the opportunity to explore influenza vaccination when a specific group is targeted for rapid immunization during a pandemic, and a number of studies have investigated various factors that influenced HCW pH1N1 immunization behaviour. Although numerous publications have reported on various reasons, attitudes, beliefs, knowledge gaps, and predictors relating to pH1N1 immunization in HCW populations, no formal review of this literature presently exists. Therefore, this systematic review examines key factors reported to have influenced pandemic influenza vaccination among HCWs from different geographic regions during the 2009/2010 influenza pandemic.

Theories of health behaviour offer researchers a theoretical framework to understand factors relating to specific health behaviours, including vaccination behaviours.[23-26] In recent years, the Health Belief Model (HBM) (Rosenstock, 1966) has provided a valuable theoretical framework for understanding factors that influence seasonal influenza (sINFLU) vaccine vaccination in a variety of populations.[22,24,26, 27] In fact, the HBM constructs have

been especially robust in explaining influenza vaccination decisions in HCW populations [21,22,26,29]

According to this theory, influenza vaccination can be understood by way of 5 key constructs:

(1) perceived barriers to accepting vaccination

(2) perceived benefits of accepting vaccination

(3) perceived susceptibility to influenza infection

(4) perceived severity of influenza infection, and

(5) cues to action (i.e. internal and external stimuli that serve as motivators for vaccination).

Research has demonstrated the utility and validity of the HBM constructs in predicting seasonal influenza vaccine uptake, thus suggesting that these constructs will also explain pH1N1 vaccination.[21,22,30] As such this review uses the five HBM constructs to better understand the factors that directed HCW influenza vaccination behaviours during the H1N1 pandemic. Additionally, predictive factors that are not fully explained by the HBM paradigm, such as socio-demographic characteristics, will also be identified to further understand and inform the future delivery of influenza vaccination among HCWs.

Better understanding of the factors influencing influenza vaccination can lead to the development of more effective interventions with improved vaccine coverage. Much like previous reviews focusing on HCW seasonal influenza vaccination behaviour, this systematic review aims to inform the design and development of future influenza immunization campaigns and pandemic planning processes via the investigation of factors that influenced HCW pandemic influenza immunization. To achieve this goal we intend to

determine factors unique to pandemic influenza vaccination and factors congruent with previous seasonal influenza vaccination research using the HBM.

3.3. Material and Methods

3.3.1 Literature search strategy

Bibliographic databases and electronic data sources were searched using a pre-defined literature search strategy *(refer to Appendix sections B1and B2 for search terms and sample search strategy)*; the following data sources were searched to identify relevant publications: MEDLINE, PubMed, EMBASE, PsycINFO, CINHAL, AMED, and Cochrane Library, Select conference papers (ProQuest Conference Papers Index), dissertations and theses (ProQuest Dissertations and Theses) databases, and websites of various public health authorities were hand searched based on keyword searches to identify additional grey literature of relevance (Sep-Dec 2011). Finally, the reference sections of all articles included in this review were scanned to identify additional publications of interest that may not have been captured by the database search.

3.3.2 Study selection

Following de-duplication, the titles and abstracts of all identified publications were screened by a reviewer (CP) for relevance. All publications remaining after the initial screen were independently screened by two reviewers (CP & RP) using the study selection criteria to establish final inclusion in the review. Only the second screening process was duplicated as a method of minimizing selection bias, and differences in agreement were resolved by consensus after discussion.

The study selection criteria applied during the study selection process is as follows, Population: Healthcare workers were defined to be all individuals employed in a healthcare setting, including persons who provide direct patient care (e.g. physicians, nurses, and allied

HCWs), as well as persons who indirectly support health services (e.g. healthcare administration and support staff). Study populations that were not composed exclusively of HCWs were included in the review if immunization rates and factors relating to immunization are reported separately for HCW subgroups.

Intervention: This review is limited to studies that focused on pH1N1 influenza immunization during the 2009/2010 pandemic; a distinction between adjuvant and non-adjuvant vaccine types is not made.

Comparator: pH1N1 influenza immunization acceptance is compared to pH1N1 influenza immunization rejection (or non-vacciantion). Only actual vaccination behaviour (i.e. vaccination and non-vaccination) are considered while intentions towards vaccination and non-vaccination are excluded.

Outcomes of interest: includes all factors, such as key reasons, beliefs, attitudes, behaviours, knowledge gaps, and socio-demographic predictors found to be important in HCW pH1N1 vaccination or non-vaccination All study reported outcomes are considered factors relevant in pH1N1 vaccination and non-vaccination if they demonstrate statistical significance (p-value <0.05) or are reported in high frequency (> 30% frequency) by the study population of interest.

Study design: The review includes observational, non-interventional (e.g. cross-sectional surveys, mixed methods, and semi-structured interviews) studies.

This review is limited to English language articles published between January 1st, 2005 and December 1st, 2011. Duplicate publications that report similar findings from the same study or dataset are only included in the review once, in such cases only the most recent publication was selected and included in the review

3.3.3 Data extraction and coding

One reviewer (CP) extracted data from all included studies using standardized data extraction forms *(refer to Appendix section B3 for a copy of the data extraction form)* while the secondary reviewer (RP) cross referenced all extracted data with each publication's full text for accuracy and completeness. When there was a conflict of interest due to authorship (i.e. Corace et al.) the secondary reviewer (RP) assumed the role of the primary reviewer and extracted data from the publication, and the other reviewer (CP) cross-referenced the extracted data.

The primary aim of the data extraction process was to capture the entire range of behavioural and socio-demographic factors that influenced HCW pH1N1 vaccination throughout the pandemic. All factors reported to be influential in HCW pH1N1 immunization outcomes were coded into five major categories using the HBM constructs. This classification strategy stems from previous research in seasonal influenza vaccination behavioural determinants.[21] Additionally, statistically significant predictors of HCW pH1N1 immunization status that are not fully defined by the HBM, such as socio-demographic factors, were also identified.

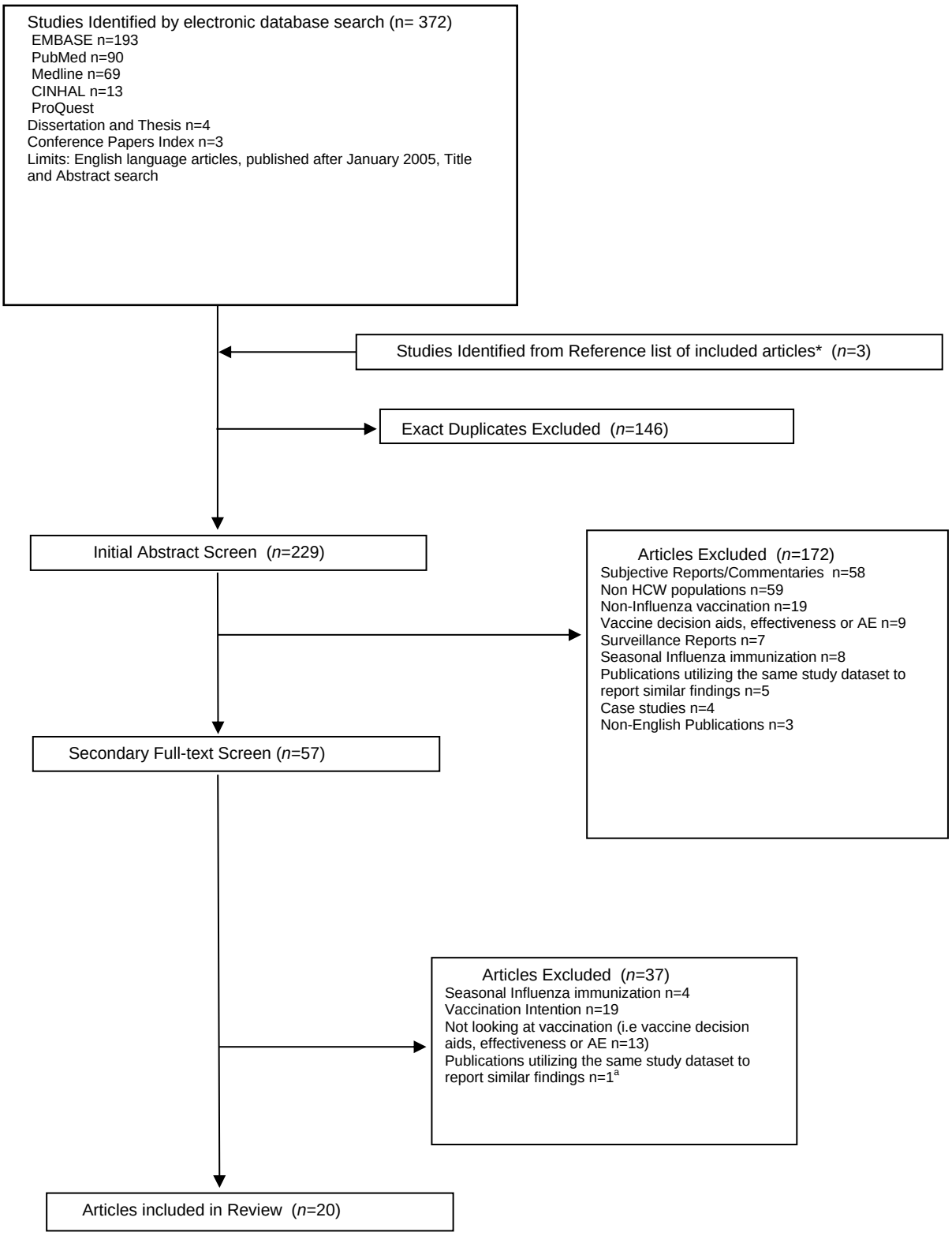
A log of all study selection, data extraction, and coding process by both reviewers was maintained to ensure transparency and consistency. All review procedures were based on PRISMA guidelines.[31]

3.4. Results

An overview of the literature search results and study selection process is provided in Figure 2.1. The literature search of all data sources yielded a total of 375 publications, and following the removal of exact duplicates 229 articles remained *(refer to Appendix section B4 for a complete list of screened publications).* During the initial round of screening, a total of 172 citations were removed by the primary reviewer (CP). The most frequent reasons for study exclusion during the primary screen include subjective reports or commentaries regarding the pandemic that do not refer to a particular study, studies that investigate non-influenza or seasonal influenza immunization, as well as non-HCW study populations (i.e. pregnant women, patients). The remaining 57 articles were separately screened by both reviewers during the secondary screen, and an additional 37 publications were excluded by the application of inclusion criteria. The most frequent reasons for study exclusion at this phase are studies relating to pandemic vaccine effectiveness, efficacy, or adverse events, and the use of pH1N1 vaccine intention as the outcome of interest. The level of agreement between the two reviewers (CP & RP) following the secondary round of screening was 95%. Following discussion 100% agreement was achieved by consensus between the reviewers.

Information extracted and coded by the primary reviewer was cross-referenced against the against each publication's full-text by the secondary reviewer for accuracy and completeness. No significant discrepancies were identified.

Figure 3.1: Overview of study selection



3.4.1 Study characteristics

20 publications consisting of 16 scientific journal articles, 2 peer-reviewed abstracts, 1 letter to the editor, and 1 research note are included in the review (Table 2.1). Of the included studies, 3 were conducted in North America, 7 in Europe, 7 in Middle Eastern regions, 1 in China, and 2 studies investigated pH1N1 vaccination among HCWs of different regions. In these two studies, Blasi et al. sampled HCWs belonging to international scientific group and Chor et al. sampled HCW groups from the United Kingdom, Singapore, and Hong Kong.[32,33] Although the exact definition of HCW varied between studies, most study populations were found to be representative of staff in hospital care settings (clinical and nonclinical staff) with and without direct patient contact. A study by Amodio et al. specifically focused on post-graduate medical residents from an Italian university hospital, while Opstelten et al. surveyed Dutch general practitioners.[34, 35]

This review focused on actual vaccination rather than the intention to be vaccinated. Therefore all of the studies included in the review were conducted after the launch of 2009/2010 pH1N1 immunization campaigns in each respective HCW population. The data collection periods of interest range from October 2009 to August 2010. The majority of studies relied on self-reported immunization status of HCW participants. Only the studies by Kraut et al. and Corace et al., both of which were conducted in Canada, report the verification of self-reported immunization status with administrative pandemic vaccination records.[36-38] Overall pH1N1 vaccination rates were found to be highly variable across study samples, ranging from 9% to 92%. Key factors reported to be predictive of pandemic vaccination were coded into the HBM 5 constructs

Table 3.1: Overview of study characteristics as reported by each study included in the review

Author	Region	Study Design	Data Collection Period	HCW population	Sample Size (n)	H1N1 vaccine coverage
Ahmed et al., 2011[p]	Saudi Arab	Cohort Study	Hajj 2010 (approx. Oct 2009)	HCWs and security servicing Hajj Pilgrims	42	34%
Alkuwari et al., 2011[p]	Arab Emirates	Cross-Sectional	March-April 2010	Nurses & Physicians	625	13%
Amodio et al., 2011[p]	Italy	Cross-Sectional	Sep-Oct 2010	Post-graduate Medical Students	202	42%
Blasi et al., 2011[n]	Global	Cross-Sectional	Dec 2009-Jan 2010	Medical society members	1334	65%
Chor et al., 2011[p]	HK, SG, & UK	Cross-sectional	Jan-April 2010	Physicians, Nurses & Allied HCWs	2100	13% HK 36% SG 41% UK
Corace et al., 2011[a]	Canada	Cross-Sectional	July-Aug 2010	All Hospital staff	3260	87.3%
Hakim et al., 2011[p]	USA	Cross-Sectional	July-Aug 2010	All Hospital staff	2036	61%
Hidiroglu et al., 2010[p]	Turkey	Focus Group	Nov 2009	Primary HCWs	33	Variable
Kraut et al., 2011[P]	Canada	Cross-Sectional	Fall 2010	All Hospital staff	2376	100%
Opstelten et al., 2010[p]	Netherlands	Cross-Sectional	Feb 2010	GPs and GPs in training	670	92%
Prevost et al., 2010[a]	France	Cross-Sectional	Not reported	Pharmacology Staff	83	46%
Sanchez-Paya et al., 2011[p]	Spain	Cross-Sectional	Not reported	All Hospital Staff	3126	22%
Savas et al., 2010[p]	Turkey	Cross-Sectional	Nov-Dec 2009	All Hospital staff	300	13%
Seale et al., 2011[p]	China	Cross-sectional	Jan 2010	Staff of Respiratory wards	1657	25%
Sevencan et al., 2011[p]	Turkey	Cross-sectional	Nov 2009	All provincial HCW	1691	35%
Stavroulopoulos et al., 2010[p]	Greece	Cross-Sectional	Not reported	All Dialysis Center staff	34	9%
Tagajdid et al., 2010[l]	Morocco	Cross-sectional	Jan-Feb 2010	All Hospital staff	1002	22%
Tanguy et al., 2011[p]	France	Cross-Sectional	Nov 2009-Feb 2010	All Hospital staff	532	36%
Torun et al., 2010[p]	Turkey	Cross-Sectional	Dec 2009	All Hospital staff	718	23%
Virseda et al., 2010[p]	Spain	Cross-Sectional	Oct 2010	All Hospital Staff	527	16%

[p] Scientific Journal Publication [a]Conference Abstract [l]Letter to the editor [n]Research Note, HK (Hong Kong), SG (Singapore), UK (United Kingdom)

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3.4.2 Summary of Study Findings

Factors reported to be influential in HCW pH1N1 immunization outcomes were coded into five major categories using the HBM constructs (Table 2.2a-c). The total number of publications that identify these factors as being important to HCW pandemic influenza vaccination was tabulated and organized according to HBM constructs (Table 2.3).

Table 3.2a. Factors reported to be important in HCW pandemic influenza vaccination based on Health Belief Model (HBM) constructs

	Ahmed et al.	Alkuwari et al.	Amodio et al.	Blasi et al.	Chor et al.	Corace et al.	Hakim et al.
Perceived Barriers							
Vaccine Safety		*				*	
Vaccine Related Adverse Effects		*		*	*		*
Vaccine was Developed Rapidly				*			
Vaccine Effectiveness or Efficacy		*					
Perceived Benefits							
Vaccine will Protect Self		*				*	*
Vaccine will Protect Loved Ones					*	*	*
Vaccine will Protect Patients						*	*
Perceived Susceptibility							
Risk of pH1N1 Infection		*	*		*	*	
Immunity via Previous Exposure				*			
Perceived Severity							
Seriousness of pH1N1		*		*			
Cues to action							
Mass Media	*						
Access of scientific information							
Public Health Authorities		*	*	*			
Physicians		*					*
Co-workers and Supervisors						*	*
Political/Public Figures							
Loved Ones		*					*

Table 3.2b. Factors reported to be important in HCW pandemic influenza vaccination based on Health Belief Model (HBM) constructs

	Hidiroglu et al.	Kraut et al.	Opstelten et al.	Prevost et al.	Sanchez-Paya et al.	Savas et al.	Seale et al.
Perceived Barriers							
Vaccine Safety						*	
Vaccine Related Adverse Effects		*		*		*	*
Vaccine was Developed Rapidly	*			*			*
Vaccine Effectiveness or Efficacy		*				*	*
Perceived Benefits							
Vaccine will Protect Self		*	*		*		
Vaccine will Protect Loved Ones		*		*	*		
Vaccine will Protect Patients		*	*		*		
Perceived Susceptibility							
Risk of pH1N1 Infection	*	*					*
Immunity via Previous Exposure			*				
Perceived Severity							
Seriousness of pH1N1	*	*		*		*	*
Cues to action							
Mass Media	*					*	
Access of scientific information	*						
Public Health Authorities	*			*			
Physicians							
Co-workers and Supervisors		*					
Political/Public Figures						*	
Loved Ones							

Table 3.2c. Factors reported to be important in HCW pandemic influenza vaccination based on Health Belief Model (HBM) constructs

	Sevencan et al.	Stavroulopoulos et al.	Tagajdid et al.	Tanguy et al.	Torun et al.	Virseda et al.
Perceived Barriers						
Vaccine Safety	*			*	*	
Vaccine Related Adverse Effects	*		*	*	*	
Vaccine was Developed Rapidly	*	*	*			
Vaccine Effectiveness or Efficacy	*				*	*
Perceived Benefits						
Vaccine will Protect Self	*			*		*
Vaccine will Protect Loved Ones				*		
Vaccine will Protect Patients				*	*	*
Perceived Susceptibility						
Risk of pH1N1 Infection	*				*	
Immunity via Previous Exposure						
Perceived Severity						
Seriousness of pH1N1	*	*				
Cues to action						
Mass Media	*		*		*	
Access of scientific information					*	
Public Health Authorities					*	
Physicians						
Co-workers and Supervisors						
Political/Public Figures					*	
Loved Ones						

Table 3.3: Number of publications identifying factors relevant to HCW pandemic influenza vaccination based on Health Belief Model (HBM) constructs

Health Belief Model (HBM) constructs	Number of Publications[A]
Perceived Barriers	
Vaccine Safety	6
Vaccine Related Adverse Effects	11
Vaccine was Developed Rapidly	7
Vaccine Effectiveness or Efficacy	7
Perceived Benefits	
Vaccine will Protect Self	9
Vaccine will Protect Loved Ones	7
Vaccine will Protect Patients	7
Perceived Susceptibility	
Risk of pH1N1 Infection	9
Immunity via Previous Exposure	2
Perceived Severity	
Seriousness of pH1N1	9
Cues to Action	
Mass Media	6
Access of scientific information	3
Public Health Authorities	6
Physicians	2
Co-workers and Supervisors	3
Political/Public Figures	2
Loved Ones	2

[A,] demonstrate statistically significant (p-value <0.05) associations with pandemic influenza vaccination or are reported in high frequency (<30% frequency) by the study population of interest

3.4.2a Perceived barriers to pH1N1 vaccination

Pandemic vaccine safety and vaccine related adverse effect: Perceptions relating to pH1N1 vaccine safety and the risk of vaccine induced adverse effects are the major barriers to pandemic vaccination among HCWs.[32,33,37-47] These two concepts are the most cited reasons for HCW non-vaccination.[32,33,37-47]. For the majority of included studies, attitudes and beliefs relating to vaccine safety and vaccine related side effects demonstrate statistically significant differences among HCWs who accepted vs. HCWs who did not accept the vaccine. A study by Torun et al. reports 81.3% vaccine acceptors believed that the pandemic vaccine was safe while only 33.9% of HCWs not vaccinated against the pandemic vaccine agreed with the same statement.[47] Similarly, Alkuwari et al. found a higher proportion of non-vaccinated HCW (49.5%) worry that adverse effect reports about the pH1N1 vaccine are accurate, in comparison to vaccine acceptors (24%).[39] Additionally, non-vaccinated HCW either overestimated or did not know the true incidence of pandemic vaccine related adverse events like Guillain-Barré, when compared to HCWs who accepted the vaccine.[33] A study by Savas et al. measured HCW anxiety during the 2009/2010 pandemic vaccine campaign using the STAI (State Trait Anxiety Inventory) questionnaire.[42] This study found state anxiety levels, a measure of anxiety at the moment of scoring, to be higher among HCWs who assumed the vaccine to be unsafe.[42] Such levels of anxiety were also found to be significantly higher among HCWs who did not rely on the pandemic vaccine and therefore did not become vaccinated.[42]

Rapidity of pandemic vaccine development: The perception that an accelerated pandemic vaccine authorization process lead to compromises in vaccine safety emerges as another key barrier to non-vaccination in a number of studies.[32, 41, 43-45, 48, 49] A qualitative, focused group based study by Hidiroglu et al. finds that some HCWs felt the pandemic vaccine underwent

an accelerated testing and authorization processes to ensure timely vaccine allocation.[48] The belief of rapid vaccine development was also resonate within an international sample of HCWs, who also report that the rate at which the pH1N1 vaccine was developed was too quickly and cite this to be a major reason for not having pH1N1 vaccination.[32] In this study, perceptions of speedy vaccine development are reported to be a major reason for pandemic vaccine refusal as frequently as concerns regarding vaccine related side effects.[32]

Pandemic vaccine will NOT be effective or efficacious: Perceptions of pandemic influenza vaccination not being an adequate mode of preventing H1N1 infections or protecting against H1N1 infections are additional barriers to vaccination.[38, 39, 42-44, 47, 50] Many HCW groups report limited vaccine efficacy or vaccine effectiveness as one of their major reasons for non-vaccination.[38, 39, 42-44, 47, 50] Alkuwari et al. states 53% of unvaccinated HCWs reported doubts about the pandemic vaccine to be a major reason for non-vaccination, and vaccine effectiveness is report to be a concern among 72.6% of unvaccinated participants.[39] This study also finds HCWs who disagreed about the pandemic vaccine's efficacy were 0.2 (0.09-0.44) times less likely to be vaccinated than HCWs who agreed the pandemic vaccine was effective.[39] Studies by both Seale et al. and Torun et al. report statistically significant differences in attitudes towards vaccine effectiveness among HCWs who did and did not accept the pandemic vaccine.[43,47] Savas et al. report similar finding and state that HCWs who found the pandemic vaccine to be protective were 4.89 (3.19-7.50) times more likely to become vaccinated than those who did not.[42] Furthermore, 55.7% of this HCW population state not believing in the pandemic vaccine's protectiveness as a key factor which was influential in their decision to remain unimmunized.[42]

3.4.2b Perceived benefits of pH1N1 vaccination

Pandemic vaccine will protect self: Belief in the vaccine's ability to specifically protect the HCW (self) emerges as an important benefit of vaccination. Personal or self-protection from pH1N1 infection through vaccination was a popular motivator for vaccination in many of the included HCW samples.[35, 37-40, 44, 46, 50, 51] Hakim et al. report 85.9% of HCWs who received the pandemic vaccine agreed that the influenza vaccine will reduce their personal risk of getting sick, which was also the most commonly cited reason for pandemic vaccination.[40] The perception of vaccination leading to reduced personal risk of pandemic influenza infection was also reported to be an important reason for becoming vaccinated by Dutch general practitioners (GP) and GPs in training.[35] Among HCWs surveyed by Virseda et al. and Sanchez Paya et al. self-protection is the most frequently mentioned reason for receiving the pandemic vaccine.[50, 51]

Pandemic vaccine will protect loved ones (e.g. family and friends) and colleagues: HCWs who perceived the vaccine to be protective or reduce the risk of infection in not only themselves, but also among their family members and friends, or even co-workers were also more likely to become vaccinated.[35,37,38,40,46, 50,51] A survey of a Pharmacology department by Prevost et al. report one of the main motivators for becoming vaccinated against pandemic influenza to be having people who are at risk of influenza in the HCW's social circle.[41] Along with pandemic vaccination and non-vaccination, Kraut et al. was also interested in exploring differences in attitudes and beliefs among HCWs who routinely become immunized against seasonal influenza.[38] This study finds HCWs who received the pandemic vaccine cite protection of family members to be an important motivator for pandemic

vaccination, regardless of previous seasonal influenza vaccination history.[38] In a study which surveys HCWs from three different populations in three different countries states, 25-30% of HCWs from the United Kingdom and Hong Kong report they got vaccinated because they did not want to transmit the infection to others.[33]

Pandemic vaccine will protect patients: Patient protection and/or patient safety via HCW vaccination is another key motivator for HCW pandemic immunization. Most vaccinated HCWs recognize protection of patients from pandemic influenza as a result of their vaccination to be a benefit of becoming vaccinated.[35,37, 38, 40, 46, 47, 50, 51] For instance, Torun et al. notes the belief that HCWs have a professional obligation to be vaccinated because of their role in patient care was the strongest independent predictor of vaccine acceptance in their HCW sample.[47] Virseda et al. also demonstrate patient protection to be a key reason for pandemic vaccine acceptance in another sample of hospital HCW staff.[50] Similarly GPs and GP-trainees from the Netherlands also list reduced risk to patients, reported at 82% in GPs and 88% in GP-trainees, to be their primary motive for pandemic vaccination.[35] In contrast, HCWs who remained unvaccinated against pandemic influenza seem to be unaware of the possible health risk they pose to their patients by remaining unvaccinated.[48] Hidiroglu et al. notes that these HCWs seemed to assess the need for vaccination based on individual risk and not of possible patient care benefits.[48]

3.4.2c Perceived susceptibility

Risk of pH1N1 influenza infection: HCWs who perceived the likelihood of pH1N1 infection to be high were more likely to become immunized against the infection, whereas HCWs who perceived themselves to not be at risk of pandemic influenza infection were less likely to become immunized.[33, 34, 37-39, 44, 47, 48] Many vaccinated HCWs felt that they were at an

increased risk of pH1N1 infection because of their professional role and work environment.[34, 38] For instance, pH1N1 vaccinated post-graduate medical residents working in a hospital setting, were 1.38 (1.08-1.75) times more likely to consider themselves a part of a high risk group for developing influenza, in comparison to their colleagues who were not vaccinated against pH1N1.[34] Furthermore, Torun et al. state non-vaccinated HCWs were most likely report being "not at all anxious" about a personal infection with pandemic influenza.[47]

Immunity from pandemic influenza infection due to previous exposure: Among a few HCW groups, individuals who perceived themselves to have been previously exposed to the H1N1 virus and therefore believe they were less susceptible to re-infection were more likely to remain unvaccinated.[32, 35] Opstelten et al. report 30% of non-vaccinated GPs state their rational for non-vaccination to be the belief that they are protected against influenza as a result of frequent professional exposure to the virus.[35] An international sample of HCWs also report previously having the pH1N1 flu as an important reason for not being vaccinated.[32]

3.3.2d Perceived severity

Severity or seriousness of pH1N1 influenza infection: HCWs who perceived pH1N1 to be either a severe or a fatal infection were more likely to be vaccinated against it.[39, 42, 44] The belief that pH1N1 is a more serious infection than the seasonal flu was another key factor for pandemic vaccination, especially among HCWs who were not vaccinated against seasonal influenza but accepted the pandemic vaccine.[38, 41] For example, in a group of Chinese HCWs surveyed by Seale et al. stated their perceived threat of pH1N1 infection (4.6) to be the greater than that of seasonal influenza (3.2) or avian influenza (2.2).[43]

In contrast HCWs who did not consider pH1N1 to be a fatal disease cited this to be a key reason for non-vaccination.[32, 38, 44, 48, 49] According to Sevencan et al. non-vaccinated HCWs were more likely to agree H1N1 was a disease that was not as dangerous as it was proposed to have been during the pandemic.[44] While the group of HCWs who participated in the focus group study are said to have assessed the severity of pandemic influenza based on the low number of pH1N1 case fatalities that were reported at the time and concluded pH1N1 was only serious among those with "poor" immune systems and pandemic influenza was not more serious than seasonal influenza.[48]

3.4.2e Cues to action (i.e. situational factors)

Mass media: Many of the studies included in the review report mass media had an inhibitory effect on pH1N1 immunization in HCWs.[42, 44, 45, 47, 48, 52] Ahmed et al. suggested misleading media reports may have led to HCWs deciding other preventative measures, such as frequent hand washing and eating citrus fruit were equally as protective as immunization.[52] These beliefs may have played a role in HCW non-vaccination behaviour. Torun et al. also report HCWs who exclusively relied on the media for pandemic influenza related information were less likely to become immunized or recommend immunization to their patients.[47] These HCWs also stated media had exaggerated the pandemic influenza situation.[47] Finally, although it was not well tested among many of the included HCW samples, a focus group study suggests the internet and social media may have also had the capacity to act as an external cue to action among some HCWs.[48]

Access of scientific literature and information sources: Although media reports and media-related conspiracy theories had a negative impact on HCW vaccination, evidence-based scientific literature enhanced HCW vaccine coverage [34,47,48] Scientific reports had a positive

influence on HCW vaccine acceptability and HCWs who report accessing scientific literature were more likely to have positive associations to pH1N1 vaccination in comparison to non-vaccinated HCWs.[47, 48] In addition to the reference of scientific reports, accurate knowledge about the MF59 adjuvant and its ability to enhance immunogenicity among post-graduate medical residents was also implicated in pH1N1 vaccination (OR 2.06 (1.14-3.72)).[34].

Trust in public health authority communications: When compared to vaccinated HCWs, HCW with the belief or attitude that the WHO over-exaggerated or over-estimated the impact of the H1N1 pandemic were 0.45 (0.21-0.97) times less likely to be vaccinated.[39] Amodio et al. find HCWs who report recommendations of Health Minister/scientific sources as their main informative source for the vaccine were 4.69 (2.1-10.49) times more likely to report pandemic vaccination in comparison to HCWs who do not report pandemic immunization.[34] Additionally, Sevencan et al. find HCWs who had negative attitudes about the Ministry of Health's response to the pandemic and perceived pH1N1 public health responses to be inconsistent and insufficient were 0.36 times less likely to become vaccinated when compared to HCWs who received the vaccine.[44] In the same study HCWs who believed the Ministry of Health to have had convenient, positive, successful and reliable responses to the pandemic were 2.40 (1.89-3.04) times more likely to be vaccinated than HCWs who remained unvaccinated.[44]

Person based cues to action (i.e. physician, family members, supervisor, co-workers, or political figures): Immunization rates were found to be higher among HCWs who believed that they were more likely to be vaccinated against pH1N1 if their doctor or loved ones (i.e. friends and family) also endorsed the pH1N1 vaccine.[39, 40, 48]

Encouragement from individuals at a HCW's place of employment, such as employer, colleagues, and supervisors, was also found to be important external cues to action.[37, 38, 40] Encouragement from such persons is reported to lead to more HCWs receiving the pH1N1 vaccine. Corace et al finds, that non-vaccinated HCWs were less likely to report that their supervisors and/or co-workers encouraged them to get vaccinated against the pandemic ($p<.001$).[37] The vaccination behaviours of various workplace opinion leaders also influenced vaccination decisions of other HCWs.[48] Certain colleagues were deemed to be opinion leaders by fellow HCW staff if these persons were thought to have had access to the best quality and most accurate vaccine related information.[48] Interestingly, opinion leaders of physicians were usually reported to be trusted professors, while the physicians themselves became opinion leaders for other HCWs in non-physician roles.[48]

Political figures also had an impact on personal vaccination decisions of some HCW samples. Specifically the Turkish Prime Minister's refusal to be vaccinated against pH1N1 was found to have had a negative impact on vaccine uptake in some Turkish HCW groups.[42,47] Savas et al., finds 40% of non-vaccinated HCWs stated they did so because of the Turkish Prime Minister's personal decision to refuse the pH1N1 vaccine.[42]

3.4.2f Other factors predictive of HCW pH1N1 immunization behaviour, not fully defined by the HBM

HCW pH1N1 immunization status was set to be the primary outcomes of interest and regression analysis was used to identify statistically significant predictors of vaccination ($p<0.05$), by a number of studies. These findings were explored in an attempt to identify additional socio-demographic factors which may have played an important role in HCW pandemic immunization. A total of 9 studies report the use of regression modeling techniques in data analysis. 2 of these studies were interested in modeling the intention of a

HCW to be vaccinated against seasonal influenza during the upcoming influenza season.[38, 47] Since this review focuses exclusively on pandemic influenza vaccination and non-vaccination as the primary outcome of interest these two reviews are not discussed further in this section.

Seasonal influenza vaccination was the most commonly cited predictor of pandemic influenza vaccination.[33, 39, 43, 47, 50] HCWs who report receiving the 2009/2010 seasonal influenza vaccine or report a past history of seasonal influenza vaccination were more likely to be vaccinated against pH1N1.[33, 50] A variety of health professions/roles also demonstrated statistically significant associations with pandemic vaccination.[33, 43, 47, 50] Specifically being a physician enhanced the likelihood of pandemic vaccination, while nursing and support staff roles are at times reported to reduce the likelihood of pandemic vaccination.[33, 43, 47, 50] Other variables found to demonstrate a positive effect on pH1N1 vaccination include allowing HCW's children to be vaccinated and recommending pandemic influenza vaccination to HCW patients.[42]

3.5. Discussion

The overall objective of this systematic review was to examine factors that influenced pandemic influenza vaccination among HCW groups from various geographic regions during H1N1 pandemic utilizing the HBM. We found the majority of factors relating to HCW pandemic influenza behaviour to be consistent with the HBM constructs of perceived barriers, benefits, severity, susceptibility and cues to action. In other words, HCWs were more likely to become vaccinated against pandemic influenza if they: 1) believed the infection to be highly susceptible and severe, 2) believed the benefits of vaccination outweighed potential barriers, and 3) were influenced by positive cues to action. These

findings further support the use of HBM as an appropriate theory for better understanding HCW influenza vaccination health behaviours in pandemic scenarios.

We also intended for this research to support the development of future influenza interventions in pandemic and non-pandemic scenarios by identifying factors both consistent with seasonal influenza vaccination and unique to pH1N1 vaccination. Our findings demonstrate many of the key factors that influenced pandemic vaccination are similar to factors determined to be important in HCW seasonal influenza vaccination by previous reviews.[9, 10,53,54] For instance, a literature review of HCW attitudes and beliefs targeting seasonal influenza vaccination by Hofmann et al. concludes misperceptions regarding: seasonal influenza risk (i.e. susceptibility), vaccine safety and adverse effects, and the role of HCWs in influenza transmission to patients to be major barriers to vaccination.[53] Another review of factors predictive of HCW seasonal influenza vaccination by Hollmeyer et al. finds HCW beliefs in vaccine efficacy and self-protection through immunization to be major motivators for seasonal influenza vacciantion.[54] Similarly to these reviews we also find HCWs were more likely to become vaccinated against pH1N1 if they had a history of influenza vaccination, believed the vaccine would be an efficacious mode of protection, and perceived the influenza infection to be severe.[33, 39, 47, 50] We also find HCWs who did not routinely become immunized against seasonal influenza perceived the pH1N1 vaccine to not be safe and cause adverse reactions, did not consider influenza vaccines to be either efficacious or protective and were most likely to avoid the pandemic vaccine.[33, 39, 42, 47] These HCWs also believed the pandemic was exaggerated and did not consider themselves, their patients nor loved ones to be susceptible to pH1N1 infections.[35, 37-40] Therefore both seasonal and pandemic influenza research reveals educating non-vaccinated HCWs about 1) the true risk of vaccine related side-effect, 2) influenza vaccine effectiveness, 3) the

importance of protecting self and others through vaccination, and 4) the range of serious health risks a unvaccinated HCW can pose to themselves, their loved ones and patients can improve influenza vaccination.

A variety of cues to action are also found to have been important in HCW pandemic and seasonal influenza vaccination.[21, 53, 54] HCW vaccination behaviour is found to be influenced by numerous external cues, in both seasonal and pandemic influenza research alike.[21, 53, 54] In our review, we find encouragement from numerous sources, such as HCW family, colleagues, supervisors, and physicians had a positive impact on pandemic influenza vaccination.[38-40] Therefore, it may be important for various positive cues to vaccination be highlighted in future influenza vaccine related interventions. Furthermore, establishing a culture of influenza vaccine promotion in the workplace, that is characterized by strong pro-immunization messaging from staff physicians, supervisors, co-workers and other opinion leaders can also enhance increase vaccine coverage among healthcare settings.

Along with the similarities there are a number of factors that are unique to HCW pandemic influenza behaviour. The battery of factors influencing HCW pandemic influenza vaccination did not include time or access to the vaccine. In contrast, inconvenient access and lack of time have often been reported by HCWs to be important reasons for not being vaccinated against seasonal influenza.[53, 54] Since this was not the case with the pandemic, it may be appropriate to assume that most HCW populations had sufficient time and access to the vaccine and logistical barriers were mitigated within pandemic vaccine campaigns. Therefore, it may be worthwhile to mimic the pandemic vaccine campaign roll-out process for future seasonal influenza campaigns to diminish accessibility and time-sensitive barriers to vaccine uptake.

The belief that the pandemic vaccine formulation was novel and rapidly developed is also unique to the pH1N1 vaccine. In fact the vast majority of HCW groups reviewed report not being vaccinated against pH1N1 because of perceptions linked to rapid vaccine development and rapid vaccine authorization process.[32, 41, 43-45, 48, 49] Many non-vaccinated HCWs considered the pandemic vaccine to be less safe than the seasonal vaccine and cited this to be a major barrier to vaccination.[32, 41, 43, 45] Such findings suggest that many HCWs may have been confused and sceptical about the pandemic influenza vaccine development and manufacturing processes either because of limitations in available knowledge or misinformation. Improved education and clear communication of influenza vaccination development, formulation, authorization, and safety among HCWs may improve future influenza vaccine coverage.

Media was found to have played an important role in pandemic non-vaccination of HCWs.[42, 44, 45, 47, 48, 52] However, the inhibitory effects of mass media on HCW vaccination appears to be absent in seasonal influenza vaccination literature. Many non-vaccinated HCWs report using mass media as their primary source of information about pH1N1, and some HCWs perceived the pandemic to be less severe or considered vaccination to be linked to a large number of adverse events as a result of media based communications.[42, 44, 45, 47, 48, 52] Additionally, some HCWs indicated that the media was responsible for over-exaggerating the occurrence and the severity of the pandemic.[42, 44, 52] In contract, HCWs who reported accessing credible scientific literature or communications from public health authorities, as well as HCWs who were accurately knowledgeable about the vaccine adjuvant and vaccine based immunogenicity was more open to pandemic vaccination.[34, 47, 48] HCWs who used mass media to acquire information about influenza vaccination but remained unvaccinated may have accessed non-credible literature and be confused about immunization and its risks.

As such, alternative strategies to enhance future influenza vaccination compliance should focus on the delivery of scientifically evidence based literature to the masses using media based communication, in order to reduce the degree of confusion and mistrust surrounding influenza immunization.

Finally, the decision of political figures to remain unimmunized operated as a negative external cue to pandemic vaccine uptake in some HCW populations.[42, 47] The Turkish Prime Minister's action to reject the pandemic vaccine, which was publicized, became a key reason for many Turkish HCWs not being vaccinated during the pandemic.[42, 47, 48] So it may be important for national health authorities to pay attention to vaccine rejection decisions of public figures when they are reported in the media and promote positive role-model vaccine strategies that in contrast encourage public engagement in vaccination.

3.5.1. Limitations

There are a number of limitations to this review that should also be considered when interpreting our findings. Firstly, this review is restricted to English language publications and publications written in other languages relating to HCW pH1N1 vaccination are not captured by this review. Secondly, the vast majority of studies reviewed relied on cross-sectional or questionnaire/survey based study designs and assumed self-reported vaccination status to be a true account of actual vaccination behaviour. These types of study designs can be vulnerable to a variety of bias, such as reporter and information bias. Thirdly, in all of the included studies HCWs were invited to voluntarily participate in the study by researchers and research staff. Some of these studies also recruited HCW personnel utilizing support and buy-in from healthcare institution's administration. Therefore the surveyed HCWs were not random samplings with adequate response rates. This may have meant the study sample

would not be a true representation of the overall study population due to selection and volunteer bias. Volunteer bias may in fact account for the low response rates observed in many studies and the discrepancies in the proportions of vaccinated and unvaccinated HCWs between the study sample and the target populations. Fourthly, almost all of the factors discussed in this review were presented to participants as forced choice options for and against pandemic vaccination within surveys and questionnaires. The majority of these choice options were generated through the review of previous research in seasonal influenza vaccination and expert consultation. Thus, some of the more sensitive nuances related to HCW pandemic immunization may not have necessarily been captured.

This review focuses on overarching factors that affected pandemic vaccination and non-vaccination in a global sample of HCWs. However, we did not specifically examine differences in: (1) national healthcare systems or individual healthcare institutions, 2) types of HCW roles included in the study samples, 3) geographical or community based circumstances affecting vaccination decisions of individual HCW cohorts, or 4) cultural perceptions towards influenza vaccination. As a result, variations in HCW reasons, attitudes, beliefs, and knowledge regarding pandemic influenza vaccination according to geographic location or cultural dynamics, as they relate to either the HCW population or their healthcare system, may not have been appropriately captured by the review's findings.

3.6. Conclusions

In conclusion, our review reveals that many of the factors relating to pH1N1 vaccination are comparable to factors associated with seasonal influenza vaccination. While key factors specific to pandemic influenza vaccination include, HCW misperceptions that the pandemic vaccine formulation is novel and accelerated from that of seasonal influenza and the belief that media or health authorities exaggerated the 2009/2010 pH1N1 pandemic.

Additionally, the HBM can provide insight into pandemic influenza vaccination decisions and explain factors influencing pandemic vaccination and non-vaccination in HCWs. We also find that many of the factors influencing pandemic influenza vaccination to be similar across HCW samples from different geographic regions. Therefore it can be appropriate to conclude that many HCWs demonstrate similar views towards pandemic influenza vaccination regardless of their geographic location and cultural-political climate.

4.0. Qualitative analysis motivators and barriers to pandemic and seasonal influenza vaccination among healthcare workers

4.1. Abstract

Introduction: Influenza is a major concern across healthcare environments. Annual vaccination of healthcare workers (HCWs) remains a key mode of influenza prevention in healthcare settings. Yet influenza vaccine coverage among HCWs continues to be below recommended targets, in pandemic and non-pandemic settings. Thus, the primary objective of this analysis is to identify motivators and barriers to pandemic (pH1N1) and seasonal influenza vaccination (sINFLU) through the analysis of HCW provided qualitative reasons for vaccine uptake (i.e. motivators) and vaccine avoidance (i.e. barriers).

Methods: Data were collected from a multi-professional sample of HCWs via a cross-sectional survey study, conducted at a tertiary-care hospital in Ontario, Canada. Key motivators and barriers guiding HCW influenza vaccination behaviour were identified through content analysis of HCW reported and ranked qualitative reasons for 1) pH1N1 vaccine uptake or avoidance, and 2) 2008/2009 sINFLU vaccine uptake and avoidance.

Results: Most HCW vaccine motivators and barriers were found to be similar for seasonal and pandemic influenza vaccination. Personal motivators had the greatest impact on vaccination. Other motivators include, 1) preventing influenza in loved ones, patients, and their communities, and 2) awareness of HCW role in infection transmission. In contrast, concerns of vaccine safety and limited HCW knowledge of influenza vaccines had the greatest impact on non-vaccination.

HCWs were motivated to accept the pH1N1 vaccine because of fear of infection, epidemiological features characteristic of pH1N1 infections, and workplace pro-vaccination

policies. HCW perceptions of accelerated pH1N1 vaccine development and vaccine safety compromises, as well as negative views of external sources (i.e. media, pharmaceutical companies, and regulatory agencies) and their management of the pandemic were barriers specific to pH1N1 vaccination.

Conclusions: To further improve HCW influenza vaccination, future vaccination programs should 1) highlight personal benefits of vaccination 2) emphasize the impact HCW non-vaccination can have on others, 3) develop communication strategies to address HCW knowledge gaps and, 4) implement workplace pro-vaccination policies similar to those in operation during an influenza pandemic. There continues to be a need for more qualitative research that investigates HCW vaccination behaviour.

Keywords: H1N1, pandemic H1N1, seasonal influenza, Healthcare workers, Qualitative Analysis

4.2. Introduction

Influenza is a major concern across healthcare environments. Health care workers (HCWs) are at risk of occupational influenza exposure and can transmit influenza to vulnerable patient populations.[5, 8-12, 14] Although annual HCW vaccination is one of the most effective modes of influenza prevention in healthcare, HCW vaccination continues to fall below recommended targets.[5, 8-10, 14]

In 2009, the rapid spread of a novel influenza strain lead to the World Health Organization (WHO) declaring the influenza pandemic H1N1 (pH1N1) and developing recommendations to guide pandemic influenza response strategies across the globe.[17-19, 28] Targeted vaccination of HCWs was a key component of the pH1N1 response process and a great deal of emphasis was placed on HCW pH1N1 vaccine coverage.[17-19, 28] Yet, HCW pH1N1 vaccine vaccination remained variable and below recommended levels.[16, 55]

Many researchers have investigated HCW pH1N1 vaccine uptake in an attempt to better understand HCW influenza vaccination behaviours. However, much of the existing pH1N1 research has focused on the quantitative analysis of factors influencing influenza vaccination.[16,55] Such research may be limited in its ability to appropriately capture the emotional and experiential nuances influencing HCWs' vaccination decisions and enhance our understating of HCW vaccination behaviour.[55]

Qualitative research can provide additional insight into an individual's worldviews, perceptions, attitudes, beliefs, and rationales regarding various health behaviours, including HCW influenza vaccination.[48, 56-58] Thus the primary aim of this study is to identify key motivators and barriers to HCW pH1N1 and non-pandemic seasonal influenza (sINFLU) vaccination behaviour, via the qualitative analysis of HCW reported reasons for personal vaccination and non-vaccination. A better understanding of the key themes and rationales

driving HCW vaccination can inform the development of immunization programs that effectively promote motivators and address barriers to improved HCW vaccine coverage.

4.3. Materials and Methods

4.3.1 Study design and participants.

Data were collected through a cross-sectional survey at a large Canadian tertiary-care hospital, in June 2010, following the conclusion of the hospital's pH1N1 vaccination campaign. All hospital HCWs (N=10,464) were invited to participate in the study by completing a bilingual questionnaire survey package via a mass mail-out. The study package included an informed consent form, a questionnaire package with various measures and a self-addressed return envelope. Study participants returned the completed questionnaire package to the hospital's Occupational Health and Safety Departments (OCHS). OCHS de-identified the returned questionnaire packages, and only the de-identified responses were analyzed by the research team. OCHS also housed records of employee vaccination; these records were used to verify the self-reported vaccination status of study participants.

4.3.2 Survey questionnaire measures

Data from survey measures on (1) socio-demographics (e.g. age, gender, occupation and department of employment etc.), (2) influenza vaccine history, and (3) qualitative reasons for pH1N1 and sINFLU vaccination and non-vaccination are included in this analysis *(refer to appendix section A for a copy of the survey).* In the qualitative reasons sections, HCWs were asked to report and rank order their three MOST important reasons for 1) 2009/2010 pH1N1 influenza and 2) 2008/2009 sINFLU (non-pandemic) vaccination or non-vaccination.

Vaccination motivators are defined as HCW provided reasons for vaccination (i.e. vaccine uptake), and vaccination barriers are defined as HCW provided reasons for non-vaccination (i.e. vaccine avoidance).

4.3.3 Content analysis

Content analysis methodology, described by Neuendorf et al., was used to code qualitative reasons; each HCW provided qualitative reason was considered a single meaning unit.[59] All meaning units (n) were coded by the primary coder (CP) using finalized sets of *a-priory* coding schemas on: 1) pH1N1 vaccination motivators, 2) pH1N1 vaccination barriers, 3) sINFLU vaccination motivators, and 4) sINFLU vaccination barriers *(refer to Appendix section C1 for the complete set of coding schemas).* All coding and analysis processes were conducted using Microsoft Office Excel (version 2003) and SPSS for Windows (version 17.0).

4.3.4 Coding schema development

The preliminary coding schema development was based on previously published literature reviews on HCW influenza vaccination behaviours.[9, 10, 25, 54, 55] These schemas were then revised according to a random subsample of meaning units (n = 100) and consultation with experts in influenza vaccination research (AM) and qualitative research methodology (JS). The resulting coding schemas were then independently tested in a random subsample of units (n=500) by two coders (CP and CV) then refined and finalized via consensus building discussion. Inter-coder reliability was established through Cohen's Kappa (κ) calculations. A log of all coding schema revisions was maintained for transparency and repeatability.

Counts and proportions of key themes were calculated to determine the most frequently reported barriers and motivators to pH1N1 and sINFLU vaccination *(refer to Appendix section C2 for counts and proportions of coded themes).*

4.4. Results

4.4.1 Study sample characteristics

A total of 10464 survey packages were sent to all active staff of the hospital and 3301 packages were returned (31.5% response rate). 3275 survey packages (n) were completed and included in the analysis. Overall, 2862 (87.4%) HCWs reported being vaccinated against pH1N1 and 2433 (74.3%) reported receiving the sINFLU vaccine. Sociodemographic characteristics of the HCW sample are presented in Table 4.1.

Table 4.1: Socio-demographic characteristics of HCW study sample (N=3275)

Characteristics	**N (%)‡**
Sociodemographics	
Mean Age	42.93 +/- 11.23
Sex: Female	2608 (81.4%)
Ethnic background: Caucasian	2884 (89.3%)
Formal Religious belief†	2516 (76.2%)
Relationship status: in a relationship	2454 (75.9%)
Dependent children < 21 years of age	1556 (48.8%)
Type of work: full-time	2335 (71.7%)
Occupation Classification	
Nursing	1153 (35.2%)
Physicians	172 (5.3%)
Allied HCWs	361 (11.0%)
Administrative/clerical	721 (22.0%)
Healthcare technicians	241 (7.4%)
Research and laboratory	276 (8.4%)
Facilities and logistics	216 (6.6%)
Other, non-clinical	135 (4.1%)
Vaccination History	
H1N1 influenza vaccination	2862 (87.4%)
2008/09 Seasonal influenza vaccination	2433 (74.3%)
2009/10 Seasonal influenza vaccination	1745 (53.8%)

Note: ‡Cumulative percentage, accounts for missing data points/values
†Includes self-report of belonging to any religious faith (e.g. Christian, Jewish, Muslim, Buddhist, etc.)

4.4.2 Summary of study findings

A total of 19531 meaning units (n) were coded into pH1N1 and sINFLU vaccination motivators or barriers using the finalized coding schemas. 8424 meaning units from HCW vaccinated for pH1N were coded as pH1N1 vaccination motivators, and 1268 meaning units from HCW NOT vaccinated for pH1N1 were coded as vaccination barriers. Cohen's Kappa (κ) was calculated to be 85% for pH1N1 vaccination motivators and 73% for pH1N1 vaccine barriers. With respect to sINFLU vaccination, 7259 meaning units were coded into sINFLU vaccination motivators and 2580 meaning units were coded as sINFLU vaccination barriers. Cohen's Kappa (κ) was determined to be 78% for sINFLU vaccination motivators and 64% for sINFLU vaccine barriers.

Key motivator and barrier themes relating to HCW pH1N1 and sINFLU vaccination were identified according to the frequency in which each theme was reported by HCW respondents. Examples of qualitative reasons coded as key pH1N1 and sINFLU vaccination motivators and barriers themes are provided in Tables 4.2a-e.

4.4.2a pH1N1 and sINFLU vaccination motivators

Most vaccination barriers and motivators, individual themes describing HCW influenza vaccination/non-vaccination, and reported proportions were found to be similar for pH1N1 and sINFLU vaccines.

Personal/self motivators: Overall, the majority of reasons for pH1N1 (28.1%) and sINFLU (28.1%) vaccination represented personal factors. Personal motivators were also the most frequently cited primary (i.e. first ranked) reasons for pH1N1 and sINFLU vaccination. Specifically themes of a) personal health, b) personal safety and protection, c) infection

prevention in self, and d) reduced infection risk to self were key personal/self motivators. Additionally, HCWs accepting both vaccines also seemed to be more aware of various risk factors (e.g. chronic illness, age, and asthma) associated with influenza infection complications as such risk factors as such risk factors in self are often reported to be motivation for vaccination.

Family and loved ones motivators: Overall, family and loved ones was another commonly cited motivation for pH1N1 (20.3 %) and sINFLU (17.6%) vaccination. In fact, family and loved one based motivators was the most frequently cited secondary (i.e. second ranked) reasons for vaccination. Safety and protection of loved ones along with preventing infection transmission (i.e. spread) to loved ones were the main themes reported within Family and loved ones motivators. Additionally, a number of HCWs stated that they become vaccinated because some of their family members/loved ones (i.e. children, grandchildren, and elderly relatives) were at increased risk of influenza related health complications steaming from pre-existing risk factors (i.e. age, chronic health conditions etc.).

Patient motivators: Concerns for patients motivated HCWs to become vaccinated against pH1N1 (10.8 %) and sINFLU (10.7 %). Motivations specific to hospital patients was the main motivator among tertiary (i.e. third ranked) reasons for vaccination. Patient's health, their safety and protection, as well as preventing influenza transmission to patients at point of work/care were found to be key themes for patient motivators. Vaccinated HCWs also understood the potential risk they can pose to their patient's health and recognized HCW vaccination can protect hospital patients from influenza complications.

Health care worker status/occupational motivators: Many HCWs also reported being motivated to be vaccinated by their HCW status and other occupational factors. Overall, 9.8% of all HCW provided reasons for pH1N1 vaccination and 11% of HCW provided reasons for sINFLU vaccination refer to such motivators. Specifically, vaccinated HCWs reported being motivated by possible increases in workload steaming from influenza related absenteeism. Additional reasons captured by this theme include reasons relating to healthcare occupations. In fact, some HCWs stated vaccination to be a HCW's professional obligation and understood HCWs were at increased risk of infection because of their work environment or profession. Some HCWs also report accepting the vaccine because influenza immunization was enforced or strongly encouraged by their employer (i.e. the hospital or training institution), this was especially true for pH1N1. Additionally, encouragement from colleagues and supervisors also motivated HCWs of the institution to accept vaccination.

Community/society motivators: Many HCWs became vaccinated because of concern for others, including their community and society at large. Vaccine uptake was greatly influenced by HCWs' desire to prevent the general spread of infection and protect others. Limiting general infection spread emerges as a key motivator among all ranked (i.e. primary, secondary, and tertiary) qualitative reasons for sINFLU vaccination. In fact, 7% of all reasons for pH1N1 vaccination and 6.4% of all reasons for sINFLU vaccination specifically refer to combating general influenza spread in others.

4.4.2b pH1N1 and sINFLU vaccination barriers

Personal/self barriers: Personal reasons again emerged as one of the two primary barriers to pH1N1 (28.6%) and sINFLU (28.4%) vaccination. Many non-vaccinated HCWs reported

being highly confident in their personal immune function and stated that their immune system could handle an infection without the vaccine. Influenza vaccination not being necessary for self, not getting the flu, and never being sick were frequently reported barriers to vaccination. HCWs also report not becoming vaccinated simply because they felt that they did not personally require influenza immunization and perceived themselves to be at low risk of infection. Furthermore, other HCWs reported remaining unvaccinated because they "do not believe in immunization", or refused the vaccines out of personal choice. Allergies and personal accounts of previous side-effects to an influenza vaccine (i.e. a sore arm, headache, or feeling sick) were other notable vaccination barrier themes.

Vaccine barriers: Alongside self related barriers, vaccine related barriers were the other set of barriers for both pH1N1 (28.7%) and sINFLU (20%) vaccinations. Specifically, vaccine safety, vaccine ingredients, possible adverse-effects or allergies to the vaccines deterred many HCWs from vaccination in pandemic and non-pandemic scenarios. Many unvaccinated HCWs report being concerned about their exposure to chemicals (e.g. thimerosal, mercury, and adjuvants) used in the manufacturing of influenza vaccines.

Furthermore, unvaccinated HCWs reported vaccine induced adverse-events experienced by others, including HCW friends and family members to be important in their personal non-vaccination decisions. Lack of confidence in the vaccine's ability to prevent infection (i.e. vaccine effectiveness), and the belief of vaccine uptake leading to influenza or influenza like illness were other common theme captured by this set of vaccination barriers.

Specific vaccination motivators and barriers

Along with similarities, there were a number of important differences among motivators and barriers to sINFLU and pH1N1 vaccination. The individual themes differentially reported for each type of vaccination are discussed below.

4.4.2c pH1N1 vaccination motivators

Personal/self motivators: Fear of a pH1N1 infection, the pandemic nature of pH1N1, and perceptions of pH1N1 being more severe than sINFLU motivated HCWs to become vaccinated against pH1N1.

Health care worker status/occupational motivators: Workplace policy mandating vaccination was another motivator theme more often reported for pH1N1 vaccination, in comparison to sINFLU vaccination.

Alternative motivators: Convenient access to the pH1N1 vaccine also contributed to HCWs becoming vaccinated. Factors like short line-ups, reduced wait times, ability to become vaccinated at work, and free access to the vaccine motivated HCWs to be vaccinated during the pandemic.

4.4.2d pH1N1 vaccination barriers

Vaccine barriers: Perceptions of limited knowledge of the pH1N1 vaccine, specifically knowledge gaps in the areas of vaccine manufacturing, vaccine research and development (R&D) processes was found to be a major barrier theme, which led to many HCWs not becoming vaccinated during pH1N1. In fact, 14.4% of non-vaccinated HCW report this specific theme as a reason for not becoming vaccinated. Many non-vaccinated HCW felt the

pH1N1 vaccine to be novel and different from sINFLU. These individuals felt the pH1N1 vaccine was rushed into development and not as vigorously assessed for vaccine safety issues or long-term side-effects, in comparison to conventional sINFLU vaccines.

Alternative barriers: Reasons specific to the pH1N1, such as the misrepresentation of the pandemic by various external sources was coded as alternative themes of pH1N1 non-vaccination. Lack of clear and consistent communication, or rather miscommunication about the H1N1 was an important barrier theme for pH1N1 vaccination. Unvaccinated HCWs felt that the pandemic was exaggerated by a variety of sources (e.g. media, pharmaceutical companies, government organizations, and other public health authorities) for conspiracy related reasons and monetary gain for such sources.

4.4.2e sINFLU vaccination barriers

All motivators for sINFLU vaccination were consistent with pH1N1 vaccination, but a number of specific barrier themes were distinctive to sINFLU vaccination.

Personal/self barriers: Interestingly, not being vaccinated in order to promote one's "natural immunity" was a key theme for sINFLU non-vaccination. Some HCWs reported that they did not receive the sINFLU vaccine to enhance their immune function and assumed exposure to the virus in the absence of immunization would improve their "natural immunity" to the virus.

Vaccine barriers: A sINFLU vaccine is designed to vaccinate against viral strains predicted to be prevalent in the upcoming flu season. This viral strain prediction process is largely based on vial strains that were most prevalent during the previous influenza season. HCWs no vaccinated against sINFLU felt this practise in influenza vaccine development may be

inaccurate in predicting the current seasons dominate strains, and as a result the sINFLU vaccine would not be effective in preventing infections during an influenza season.

Alternative barriers: A number of unvaccinated HCWs also state that they did not receive sINFLU vaccination out of habit, in other words because they simply do not become immunized against influenza.

Table 4.2a: Key motivators to pH1N1 and sINFLU vaccination uptake among HCWs

Motivators	**Examples of reasons from HCW responders**
1. Personal/self:	
i-Prevention of influenza/flu/sickness in self	"To prevent myself from getting it and getting sick" "Prevent influenza in me " "Catching H1N1 (sINFLU) "
ii-Personal health issues that increase the risk of Influenza related health complications	"Compromised immune system" "Have asthma"
iii-Improve or preserve self health	" To be immunized" "Keeping myself healthy
iv-Vaccination as a means of self-protection from influenza and/or personal safety	"Protect myself" "My own safety"
v-Reduce the RISK of influenza/infection/sickness for self	"Decrease risk of getting infected" "Lessen chance of acquiring H1N1 (sINFLU)"
2. *Family and loved ones:*	
i-Prevention of influenza/flu/sickness in family members	"Prevent family from getting the disease" "Keep family from getting sick" "Not infect friends"
ii-Family members have health issues that increase their risk of Influenza related health complications	"Mother-in-law is immuno-sufficient" "My father has health problems, pH1N1 would be dangerous for him" "Family member with a chronic health condition"
iii-Improve or preserve the health/immunity of family members	"My husband's Health" "Immunity for family and friends" "Family health concerns"
iv-Vaccination as a means of protecting family members from Influenza or ensuring their safety	"Keep family and friends safe" "Protecting my family"
v-Prevent infection spread to family members	"Not bring influenza home to family" "Prevent influenza spread to family members" "To ensure I did not infect my family"

Table 4.2a continued: Key motivators to pH1N1 and sINFLU vaccination among HCWs

Motivators	**Examples of reasons from HCW responders**
3. Patients:	
i-Prevention of influenza/flu/sickness in Patients	"Prevent my patients from getting the disease" "Stop H1N1 in patients" "Reduce Influenza among patients"
ii-Work with patients with health issues that increase their risk of Influenza related health complications	"Work with elderly patients" "Protect vulnerable patient populations" "I work with immune suppressed patients"
iii-Vaccination as a means of protecting patients from Influenza	"For patient safety" "Patient protection"
iv-Prevent Spread to Patients	"Prevent patients from catching pH1N1 (sINFLU) from me" "Not spreading H1N1/flu to patients"
4. HCW status/occupational:	
i-HCW status implicates influenza vaccination	"All HCWs should be vaccinated" "It is my duty to be vaccinated" "It is the right thing to do in a healthcare workplace"
ii-HCW status increases risk/likelihood of influenza infection to self	"As healthcare worker, high risk" "I could have caught it easily from patients" "I work in a hospital and could get or spread H1N1"
iii-Absenteeism	"Loss of work will put me back too much - work backlog" "I do not want to miss work"
iv-Vaccination made compulsory by employer or academic institution	"Recommended by the hospital" "School made up take the vaccine for our placement" "The hospital made us"
5. Community/ society:	
i-Prevent spread and transmission of infection to others	"To break the transmission (chain)" "Decrease risk of propagating (infection) to population(s) in general" " Prevent spread of influenza"

Table 4.2b: Key barriers to pH1N1 and sINFLU vaccination among HCWs

Barriers	Examples of reasons from HCW responders
1. Personal/self:	
i-Vaccination not considered as being important or necessary for self	" I don't want the vaccine" " Didn't think I needed it (vaccine) "
ii-Personally of good/sound health and do not require the vaccine	" My immune system will take care of it" "I don't think it's necessary for a healthy individual" "I have a strong immune system"
iii-Do not get sick or become infected with influenza	" I have never had the flu" " Strong immune system, never had the flu in all my years in healthcare" " I never get sick"
iv-Report adverse events/side-effects to previous vaccinations	"Allergic reactions to HBV vaccination" "Adverse reactions to all previous influenza vaccines received" "I had severe headaches after getting the influenza vaccine a few years ago"
v-Personal choice or disbelief in influenza vaccination	"I don't believe in getting vaccinated for everything out there" "My decision not to be vaccinated"
2. *Vaccine:*	
i-Vaccine Safety	" Do not have confidence in the safety of the ingredients (thimerosal) used in the production and storage of influenza vaccines in general" " Fear of injecting foreign substances into my body" "I believe that some vaccines are the cause of other health problems i.e. GB (Guillain-Barre)"
ii-Vaccine efficacy/effectiveness	" The vaccine does not/will not prevent influenza" "Little data proving effectiveness…"
iii-General side-effects or possible allergies due to vaccine uptake	" I do not need any possible side effects" " Concern re: long term effects of too many vaccinations"
iv-Vaccination leads to sickness (i.e. influenza)	"The vaccine causes influenza" "I don't want to get sick from vaccine" "get very sick every year I get the vaccine, the years I don't I don't get sick"

Table 4.2c: Key motivators to pH1N1 vaccination among HCWs

Motivators	**Examples of reasons from HCW responders**
1. Personal/self:	
i-Fearful or scared of infection and/or infection related death	" Fear of contracting H1N1/ swine flu" "Scared of this new disease"
2. *HCW status/occupation:*	
i-Financial factors, pressures of missing work	"I can't afford to be off without pay should an outbreak occur" "If I was sick with pH1N1 I would not get paid if I did not get vaccine" " Didn't want to miss any work-not getting paid"
3. Co-workers/colleagues:	
i- Staff members encouraged or motivated HCWs to become vaccinated	" I got the vaccine to make my boss happy" " Peer pressure to become vaccinated" " Our entire unit went as a group to get the vaccine"
4. Alternative reasons:	
i-Vaccine was conveniently available	"The hospital offered it (vaccine)" " They were doing it (vaccination) in our unit" "Ease of receiving (the) vaccine at work" "No lineups when I went"
ii-pH1N1 was severe and/or different from the sINFLU	"New influenza that had reached pandemic status" "At risk population unknown" "(H1N1) seemed to affect more young, healthy people than seasonal flu"

Table 4.2d: Key barriers to pH1N1 vaccination among HCWs

Barriers	**Examples of reasons from HCW responders**
1. *Vaccine:*	
i-Limitations in knowledge/information	"I did not trust the amount of time the manufacturer used in preparing and marketing the product" " Medical community not united in their opinion of the vaccine" "Not enough information about this vaccine"
2. *Alternative reasons:*	
i-The pandemic was misrepresented by External sources (i.e. media, public health authorities, and/or pharmaceutical companies)	"Media hysteria turned me off " "Exaggerating seriousness proven that media and WHO over did" "Money making business - pharmaceutical companies"

Table 4.2e: Key barriers to sINFLU vaccination among HCWs

Barriers	**Examples of reasons from HCW responders**
1. Personal/self:	
i-Enhancing self health/immunity	"(The) body needs to fight off some flu" "Would rather build immunity naturally rather than with vaccine"
2. Vaccine:	
i-Vaccine efficacy/effectiveness (specifically vaccine strain prediction)	"Seasonal vaccination is an educated guess at best of the prevalent influenza types, and natural selection will select for non-immunized serotypes" " May not even be the right vaccine, chosen by looking at trends from last year's" " don't believe they have the right strain year to year"

4.5. Discussion

The primary objective of this study was to present a qualitative account of HCW reported motivators and barriers to pH1N1 and sINFLU vaccination. To our knowledge, this is the only study to simultaneously investigate pH1N1 and sINFLU vaccine motivators and barriers by way of a qualitative analysis of HCW reported and ranked reasons.

Most HCW vaccination motivators and barriers were found to be similar for sINFLU and pH1N1 influenza vaccines. Our results demonstrate themes of personal motivators and barriers had the greatest influence on HCW vaccination decisions, suggesting possible personal impacts can encourage vaccination if the impacts are viewed to be positive and discourage vaccination if viewed to be negative. Therefore, it may be worthwhile for future vaccination campaigns to continuously emphasize personal motivations and benefits of influenza vaccination, while simultaneously addressing self-based barriers to vaccination, to improve HCW vaccination.

Altruism was found to have played a significant role in HCW vaccination decisions. Protection and infection prevention of loved ones, patients, colleagues, and communities at large are reported to be key reasons for vaccination during pandemic and non-pandemic influenza seasons. Furthermore, recognizing HCWs are at increased risk of infection at point of work/care, and understanding HCWs can transmit infection to at risk patient populations were other notable motivators of vaccination. In summary, vaccinated HCWs recognized influenza to be a potentially serious and severe infection to themselves and those around them and accepted vaccination to engage in infection prevention. It is worth noting, similar attitudes towards vaccination have frequently been reported by previous studies investigating both pH1N1 and sINFLU vaccination of HCWs.[9, 10, 16, 48, 54, 55] Based on these findings, future vaccination campaigns should look towards promoting altruistic vaccination benefits

and highlight the possible negative effects a HCW's non-vaccination decisions can have on others around them.

Additionally, occupational factors and HCW status also motivated HCWs to be vaccinated during the pandemic. It is important to note, pro-vaccination workplace policies were especially influential in HCW vaccination during pH1N1. Furthermore, this study is one of the few studies to report the positive influence workplace policies and co-worker encouragement can have on HCW pH1N1 vaccination. These findings affirm effective and clear vaccination policies and a culture of pro-vaccination in the workplace, coupled with support from healthcare organizational leaders can improve HCW influenza vaccine coverage.

The pandemic nature of pH1N1 meant HCWs were motivated to become vaccinated for reasons beyond personal benefits and altruism. These motivators include epidemiological features specific to pH1N1 infections, media attention surrounding the pandemic, and HCWs being fearful of the pandemic. These reasons led to HCWs perceiving pH1N1 to be more serious and severe than sINFLU and accepting immunization. However, the underlying factors influencing such HCW perceptions of pH1N1 are largely unknown, therefore more qualitative type research should be undertaken to better understand the role of factors specific to pandemic influenza and HCW pH1N1 vaccination.

During pH1N1, our institution established a number of strategies to improve pH1N1 vaccine accessibility and uptake among staff. These strategies included extended vaccine clinics, weekend vaccine clinics accommodating both staff and staff family members, peer to peer vaccination programs, and notifications from hospital administration to departmental supervisors asking them to promote vaccination. These efforts lead to shorter line-ups and improved pH1N1 vaccine access in our HCW sample. Although this was not found to be the

case with our HCW sample, inconvenient vaccine access, scheduling issues, and lack of time are often reported to be major barriers to HCW sINFLU vaccination in other studies conducted prior to pH1N1.[8, 10, 54] Since improved vaccine access improved pH1N1 vaccination it may be worthwhile to mimic pH1N1 vaccination rollout processes during future non-pandemic influenza seasons to increase HCW vaccine coverage.

As with vaccination motivators, most barriers to pH1N1 and sINFLU were similar, however a number of subtle differences were also noted. Although, barriers for vaccination are slightly variable most reasons for non-vaccination can be linked to limited HCW confidence and misinformation about influenza vaccines For instance, HCWs' confidence regarding vaccine effectiveness (i.e. ability to prevent infection in self and others) positively influenced pH1N1 and sINFLU vaccination, while concerns of vaccine safety and effectiveness lead to HCWs remaining unvaccinated in pandemic and non-pandemic settings.

HCWs not vaccinated against pH1N1 often reported limited research, accelerated vaccine development processes, and conflicting communications about the pandemic as key reasons for non-vaccination. Compromised vaccine safety due to accelerate vaccine development was largely specific to pH1N1 non-vaccination in our HCW sample. Similar results have also been reported by another focus group qualitative study on HCW pH1N1 vaccination.[48] Such barriers imply that pandemic vaccination programs did not effectively address HCWs' concerns about pH1N1 vaccine development and safety. Therefore, more effective communication strategies and consistent messaging should be developed to educate HCWs about influenza vaccines, especially during influenza pandemics when the infection and vaccine of interest is perceived to be novel and different from seasonal infections.

Furthermore, HCW perceptions regarding management of the pandemic by various external sources such as the media, pharmaceutical companies, government organization, and

public health authorities negatively influenced pH1N1 vaccination. HCWs state lack of transparency, monetary gain and conspiracy theories to be their reasons for pH1N1 non-vaccination. These findings demonstrate that the elevated degree of attention received by pH1N1 actually had negative implication to HCW vaccination. Thus, more attention should be directed at combating negative perceptions of HCW towards influenza vaccination and external sources, especially during future pandemics.

In regards to sINFLU vaccination, numerous sINFLU unvaccinated HCWs mistakenly believed non-vaccination would lead to the enhancement of "natural immune function", and considered this to be superior to vaccine generated immunity. Presently there is no scientifically valid research to support such rationalizations regarding influenza immunogenicity, which means these HCWs are misinformed about immunization, influenza vaccination, and general immune function. This view is further supported by previous research that report HCWs who are knowledgeable about influenza vaccines, vaccination risks, and immunogenicity are more likely to become vaccinated.[10, 34, 40, 54] Therefore, HCW access to accurate information regarding a) influenza transmission, b) risk and presentation of vaccine related side-effects, and c) vaccine ingredients and development processes may allay HCW concerns and bridge their knowledge gaps to convince previously unvaccinated individuals to become vaccinated

4.5.1 Limitations

Our study findings should be considered while acknowledging its limitations. Firstly, we sampled HCWs working at a healthcare institution in a single geographic location. Therefore we cannot make certain these results are applicable to other HCW populations, which limits the generalizability of our findings. Furthermore, vaccinated HCWs may have been more likely to participate in this study leading to volunteer bias and the

overrepresentation of vaccinated HCWs in the study sample. Additionally, HCWs responding to the survey may have provided plausible and socially acceptable reasons for their vaccination behaviour which may not be representative of their true motives, thus introducing error into our findings

As it is the nature of qualitative research, the *a-priori* coding schema development and content analysis processes may have been influenced by personnel and social contexts of this research.[59] Therefore we accept our definitions and classifications of vaccination motivator and barrier themes to be somewhat subjective and coder dependent. Additionally, since the coding development process was highly dependent on previous research, which is largely quantitative, our analysis may not be adequately sensitive to more subtle barriers and motivators guiding HCW vaccination. We also acknowledge that there may be alternative themes that explain HCW influenza vaccination, which may not have been identified or fully explored by this qualitative analysis and interpretation. However, despite these limitations, our findings are found to be consistent with the existing quantitative and qualitative literature on HCW pH1N1 and sINFLU vaccination behaviour.

4.6. Conclusions

This study provides direction for future vaccination programs to improve vaccine coverage across healthcare settings. However, there continue to be a need for additional qualitative research, such as focus groups and qualitative interviews, that more fully explore vaccination behaviours with a qualitative lens. More qualitative type research can improve our understanding of factors driving HCW influenza vaccination to improve vaccine coverage and enrich the quality of existing research.

5.0. Predicting (pH1N1) influenza vaccination among healthcare workers (Adapted from a manuscript to be submitted to Canadian Medical Association Journal (CMAJ))

5.1. Abstract

Background: Healthcare worker (HCW) vaccination was critical to protecting HCWs during the H1N1 pandemic. However, HCW vaccination rates fell below recommended targets. This study examined factors influencing HCW pH1N1 vaccination in a large, multi-professional Canadian sample. We sought to identify modifiable factors that predict vaccination since these factors can be influenced in future vaccine campaigns to improve vaccine coverage.

Methods: A cross-sectional survey was conducted at a large Canadian tertiary care hospital. HCWs (N=3275) completed measures of demographics, vaccination history, influenza risk factors, and attitudes towards pH1N1 vaccination. Self-reported vaccination status was verified with staff vaccination records. Of the total sample, 2862 (87.4%) HCWs received the pH1N1 vaccine. Multiple logistic regression analyses were used to predict HCW vaccination.

Results: Analysis of the data revealed HCW attitudes towards vaccination significantly predicted vaccine uptake, even after adjusting for demographics, vaccine history, and influenza risk factors. The combined model correctly predicted 95% (CI 0.93-0.96) of HCW vaccination. Key modifiable factors driving HCW vaccination include: (1) desire to protect family members and patients, (2) belief that vaccination is important even if one is healthy, (3) confidence in vaccine safety, and (4) supervisor and physician encouragement.

Conclusions: This research identified fundamental reasons why HCWs become vaccinated and provides direction for future influenza vaccination programs. Targeting HCW attitudes

in influenza vaccine campaigns may improve vaccination. Further, creating a culture of vaccine promotion in the workplace, characterized by strong messaging from supervisors and physicians, is important to enhance vaccine coverage.

5.2. Introduction

Maintaining the health and availability of Healthcare workers (HCWs) is an essential component of pandemic preparedness.[17, 19, 28] A key to protecting HCWs during the H1N1 influenza pandemic was vaccination.[17-19, 28] Vaccination of HCWs against pandemic H1N1 (pH1N1) was prioritized as essential for outbreak management and healthcare pandemic response.[17-19, 28] Yet, despite the vaccine's proven effectiveness and the highly visible nature of the pH1N1 vaccine campaign, HCW vaccination rates fell well below recommended targets.[16, 55]

Some researchers have reported on factors influencing HCW pH1N1 vaccine uptake; however, the majority of this research focused on intent to be vaccinated (as opposed to actual vaccination status) and did not to investigate the impact of HCW attitudes and beliefs on their vaccine uptake.[55] Thus, existing literature is limited in its capacity to enhance the current understanding of HCW influenza vaccination behaviour. This study seeks to address this gap in the literature through the examination of a broad array of factors (including HCWs attitudes and beliefs) that predict *actual* pH1N1 vaccination among a large multi-professional sample of Canadian HCWs. Furthermore, by applying the Health Belief Model framework (HBM) [27], a well-established theory of health behaviour change, we sought to identify modifiable factors that predict vaccination in our sample. Such modifiable factors could be influenced in future vaccine campaigns.

The overall goal of this study was to identify modifiable attitudes and beliefs driving HCWs towards pH1N1 vaccination in order to inform the future design and implementation of a more effective vaccination campaign, thereby increase vaccine coverage. Understanding the fundamental reasons why a core group of HCWs failed to receive pH1N1 vaccination despite an aggressive campaign, perceived vaccine shortage, and national media coverage

may help us develop a successful vaccination campaign to enhance uptake among the most recalcitrant HCWs.

5.3. Materials and Methods

5.3.1 Study design and participants

This cross-sectional observational study was conducted at a tertiary care hospital in Ontario, Canada. Following the conclusion of the hospital's pH1N1 vaccination campaign in June 2010, all hospital HCWs (N= 10,464) were invited to complete a bilingual study questionnaire through a mass mail-out. The study package included an informed consent form, a questionnaire package, and a stamped, self-addressed return envelope. Participants returned their completed questionnaires to Occupational Health and Safety (OCHS). OCHS de-identified the questionnaires, and only de-identified responses were analyzed by the research team.

OCHS housed a list of employees who received the pH1N1 vaccine and those who did not. These records were used to verify the self-reported vaccination status of HCWs responding to the survey; thus allowing the prediction of *actual* vaccine uptake.

5.3.2 Study questionnaire measures

HCWs completed measures of: (1) socio-demographics (e.g. age, gender, occupation and department of employment etc.), (2) influenza infection risk factors, (3) influenza vaccine history, and (4) pH1N1 vaccine attitudes are included in this analysis *(refer to appendix section A for a copy of the survey).* HCW attitudes towards pH1N1 was assed using the 34-item pH1N1 Vaccine Attitudes and Knowledge Scale, adapted from questionnaires developed to measure behavioural determinants associated with influenza vaccination in HCWs. [21, 30]. This scale surveys the 5 constructs of the Health Belief Model (HBM), [27](i.e. susceptibility to influenza, severity of influenza, benefits of accepting vaccination, barriers

to accepting vaccination, and cues to action), as well as assesses general attitudes of HCWs towards pH1N1 vaccination. Participants indicated the extent to which they agree or disagree with scale items on a 5-point Likert scale.

5.3.3 Statistical analysis

All analyses were conducted using SPSS/PASW v.17 statistical package. Data was initially screened and statistical assumptions were evaluated. Descriptive and frequency statistics were used to evaluate the responses to individual scale items of the questionnaires. The distribution of key socio-demographic variables and pH1N1 vaccine coverage of the study sample was compared to the overall HCW population (i.e. staff at the institution) to assess external study validity. HCW reported level of agreement with each pH1N1 Attitudes and Knowledge Scale item was dichotomized into agree and disagree statements (agree = strongly agree and agree) vs. (do not agree = neither agree nor disagree, disagree, and strongly disagree), dichotomy consistent with previous research.[21]

Chi-square analyses, independent samples *t*-tests, and univariate analysis were used to examine differences between vaccinated and non-vaccinated HCWs in terms of socio-demographics, occupation, vaccine history, influenza risk factors, and agreement with pH1N1 Vaccine Attitudes and Knowledge Scale items. Odds Ratios (with 95% confidence intervals) were calculated to examine associations between independent factors (i.e. socio-demographics, occupation, vaccine history, influenza risk factors, and agreement with pH1N1 Vaccine Attitudes and Knowledge Scale items) and HCW pH1N1 vaccination.

Multivariate logistic regression analysis, forward stepwise selection of variables, was used to model factors predictive of HCW pH1N1 vaccination. The inclusion of factors in the multivariate regression analysis process was based on the univariate analysis (i.e. statistically significant (p-value <0.1) predictors of pH1N1 vaccination), as well as a systematic review

of HCW pH1N1 vaccination literature.[55] It is important to note that a number of predictive models were developed to better examine associations between predictor variables and HCW pH1N1 vaccination, however only the most robust models are discussed further *(refer to Appendix section D1 for information on the entire range of models generated).*

In an attempt to quantify the ability of pH1N1 Vaccine Attitudes and Knowledge Scale items to predict pH1N1 influenza vaccination behaviour, two independent regression models were generated. All factors found to be statistically significant predictors of HCW pH1N1 vaccination (p-value <0.05, OR CI excludes 1) were included in the final models:

Model (1), Base Model (includes key socio-demographics, occupation, influenza infection risk factors, and vaccination history related variables, but excludes pH1N1 Vaccine Attitudes and Knowledge Scale items), and

Model (2) Base Model plus pH1N1 Vaccine Attitudes and Knowledge Scale items (includes all variables in the base model plus the pH1N1 Vaccine Attitudes and Knowledge Scale items (p-value <0.05, OR CI excludes 1). The discriminative power of both models to correctly classify HCW pH1N1 vaccination was assessed using AUC (i.e. area under the receiver operating (ROC) curve).

A ROC curve is a two-dimensional depiction of a classification models' performance, and the AUC is a scalar value which represents a classification model's discriminative strength. Thus, in the context of our analysis, AUC provides a technique for comparing each of the two models' ability to correctly classify pH1N1 vaccination and non-vaccination within the study sample.

5.4. Results

5.4.1 Study sample characteristics

A total of 10464 survey packages were distributed to hospital staff and 3301 packages were completed and returned, yielding a response rate of 31.5%. Of these 3275 surveys were adequately completed and included in the data analysis. The distribution of the study sample's gender, pH1N1 vaccination status, and occupation group was found to be comparable to that of the overall HCW population when verified with administrative staffing records.

There was 99.6% concordance in the study sample, between self-reported pH1N1 vaccination status and OCHS occupational health and safety records, indicating self-reported vaccination is a valid measure of *actual* vaccine uptake in this HCW sample. In the overall sample (N=3275), a total of 2862 (87.4%) HCWs received the pH1N1 vaccine, while 413 (13%) did not receive the pH1N1 vaccine. The average age of the study sample was 42.9 years (SD=11.23), and the majority of HCWs were women (81%), and nurses (35%). Additionally, 53.8% of HCWs reported receiving the 2009/2010 sINFLU vaccine during pH1N1, and 74.3% of HCWs reported 2008/2009 seasonal influenza vaccination. Socio-demographics characteristics of the study sample are presented in Table 5.1.

5.4.2 Predictors of pH1N1 vaccination among HCWs

Socio-demographic, influenza risk factors, and vaccine history predictors are presented in Table 5.2. Compared to non-vaccinated HCWs, vaccinated HCWs were older, in a steady relationship, and living with their dependent children at the time of the pandemic ($p<0.05$). HCWs who received the pH1N1 vaccine were also more likely to have received previous seasonal influenza vaccines ($p<0.001$). In addition, vaccinated HCWs were working

in full-time, clinical positions ($p<0.001$), and reported more frequent contact with children, the elderly, and loved ones living with a chronic health condition compared to unvaccinated HCWs ($p<0.05$). A higher proportion of non-vaccinated HCWs cited side-effects to eggs or vaccine components, when compared to vaccinated HCWs ($p<0.001$). Neither perceived self-health nor a self-reported previous influenza infection was found to be predictive of pH1N1 vaccination.

Table 5.1: Socio-demographic characteristics of HCW study sample (N=3275)

Characteristics	**N (%)‡**
Sociodemographics	
Mean Age	42.93 +/- 11.23
Sex: Female	2608 (81.4%)
Ethnic background: Caucasian	2884 (89.3%)
Formal Religious belief†	2516 (76.2%)
Relationship status: in a relationship	2454 (75.9%)
Dependent children < 21 years of age	1556 (48.8%)
Type of work: full-time	2335 (71.7%)
Occupation Classification	
Nursing	1153 (35.2%)
Physicians	172 (5.3%)
Allied HCWs	361 (11.0%)
Administrative/clerical	721 (22.0%)
Healthcare technicians	241 (7.4%)
Research and laboratory	276 (8.4%)
Facilities and logistics	216 (6.6%)
Other, non-clinical	135 (4.1%)
Vaccine Uptake	
H1N1 influenza vaccination	2862 (87.4%)
2008/09 Seasonal influenza vaccination	2433 (74.3%)
2009/10 Seasonal influenza vaccination	1745 (53.8%)

Note: ‡Cumulative percentage, accounts for missing data points/values
†Includes self-report of belonging to any religious faith (e.g. Christian, Jewish, Muslim, Buddhist, etc.)

Table 5.2: Socio-demographic, influenza risk factors, and vaccine history predictors of HCW pH1N1 vaccine uptake

Characteristics	Did not receive pH1N1 vaccine (n=413)	Received pH1N1 vaccine (n=2862)	p-value
Sociodemographics			
Mean Age	40.24 +/- 11.67	43.32 +/- 11.14	0.023
Sex: Female	83.7%	81.0%	0.196
Ethnic background: Caucasian	87.7%	89.6%	0.020
Formal religious belief	64.9%	75.8%	<0.001
In a relationship	70.8%	76.6%	0.013
Dependent children < 21 years of age	41.6%	49.8%	0.002
Children living at home	43.6%	52.3%	0.001
Type of work: full-time	61.4%	73.2%	<0.001
Occupation Classification			
Nursing	30.5%	35.9%	<0.001
Physicians	1.2%	5.8%	
Allied HCWs	7.3%	11.6%	
Administrative/clerical	31.0%	20.7%	
Healthcare technicians	5.3%	7.7%	
Research and laboratory	9.4%	8.3%	
Facilities and logistics	7.7%	6.4%	
Other-non-clinical	7.5%	3.6%	
Influenza Infection Risk Factors			
Regular contact with children	50.1%	62.8%	<0.001
Regular contact with the elderly	46.2%	59.6%	<0.001
Living with someone with a chronic illness	9.2%	14.1%	0.004
Family member has a chronic illness	18.17%	27.6%	<0.001
Personally has a chronic illness	10.5%	14.1%	0.029
Influenza History			
Past side-effects to influenza vaccination	26.1%	23.8%	<0.001
Egg-allergy	3.2%	0.6%	<0.001
Allergy to vaccine components	10.9%	0.8%	<0.001
Previous influenza infection	41.5%	41.0%	0.84
Perceived self health			
Poor	0.7%	0.2%	0.078
Fair	3.7%	2.6%	
Good	23.5%	23.0%	
Very good	43.3%	41.8%	
Excellent	28.9%	32.4%	
Vaccine Uptake			
2008/09 Seasonal influenza vaccination	24.1%	81.7%	<0.001
2009/10 Seasonal Influenza vaccination	9.8%	60.2%	<0.001

5.4.3 HCWs pH1N1 Attitudes and Knowledge Scale item predictors (HBM constructs)

The odds ratios (OR) with 95% confidence intervals, as well as the proportions of vaccinated and non-vaccinated HCWs who agree with each of the scale items are presented in Table 5.3

5.4.3a Perceived susceptibility

Overall, perceived personal susceptibility to H1N1 infection was significantly associated with pH1N1 vaccine uptake ($p < .05$). Compared to non-vaccinated HCWs, those who received the vaccine were more likely to agree that a person requires the pH1N1 vaccine even if they are healthy. Vaccine acceptors were more likely to perceive they were 1) at high personal risk of pH1N1 influenza, 2) at risk of being infected by patients, and 3) at greater overall risk of pH1N1 infection than the general public. Additionally, vaccinated HCWs were more likely to believe that their vaccine uptake would not only reduce personal susceptibility to pH1N1 infection, but also reduce infection transmission to their patients.

5.4.3b Perceived severity

Compared to non-vaccinated HCWs, HCWs who received the pH1N1 vaccine were more likely to perceive: 1) pH1N1 is personally dangerous, 2) pH1N1 infection would interfere with their daily activities, 3) pH1N1 infection is scary, and 4) pH1N1 is dangerous to their patients. Non-vaccinated HCWs tended *not* to perceive pH1N1 as personally dangerous or scary.

5.4.3c Perceived benefits of pH1N1 vaccination

HCW perception that the pH1N1 vaccine is safe was the most important perceived benefit to predict vaccine uptake. Additional benefits motivating HCWs to receive the pH1N1 vaccine include: 1) protection of self, patients, and family members from being

infected, and 2) preventing the spread of pH1N1. Of note, the associations between vaccination and the desire to protect family members and patients were stronger than the association between vaccination and the desire to protect self. Non-vaccinated HCWs were more concerned about vaccine side-effects and vaccine allergies than vaccinated HCWs.

5.4.3d Perceived barriers to pH1N1 vaccination

The most important barrier to vaccination in this study was the perception that the vaccine could cause illness. In comparison to non-vaccinated HCWs, vaccine accepters were more likely to agree that the vaccine would NOT make its recipients sick. In comparison to vaccine accepters, non-vaccinated HCWs were more likely to cite additional barriers to vaccination, including: 1) lack of time to be vaccinated, 2) concerns regarding vaccine side-effects, and 3) vaccination interfering with daily activities. Interestingly, fear of needles and disliking injections were not statistically significant barriers to vaccination.

5.4.3e Cues to action

Vaccine uptake was higher among HCWs who perceived pH1N1 vaccination is important to their friends, family, and colleagues. As well, compared to non-vaccinated HCWs, those who received the vaccine were more likely to report that their physicians and supervisors encouraged them to get vaccinated.

5.4.3f Attitudes towards vaccination

Belief that all HCWs should be vaccinated against pH1N1 was the strongest predictor of pH1N1 vaccination. Conversely, non-vaccinated HCWs were more likely to agree that HCWs should have freedom of choice in vaccination compared to their vaccinated colleagues

Table 5.3: HCW pH1N1 Vaccine Attitudes and Knowledge Scale item predictors of HCW pH1N1 vaccine uptake

Factor	Did not receive pH1N1 vaccine (n=407)†	Received pH1N1 vaccine (n=2849) ‡	Odds Ratio (95%CI)
Perceived Susceptibility to Influenza			
I am at high personal risk for getting pH1N1*	12.4%	40.6%	4.81 (3.54, 6.51)
It is very likely that I can infect patients with pH1N1 if I don't get the pH1N1 vaccine*	13.7%	47.2%	5.63 (4.21, 7.53)
I am likely to get pH1N1 if I do not get the pH1N1 vaccine*	5.4%	27.6%	6.70 (4.33, 10.38)
The pH1N1 vaccine IS required for a healthy person*^{R}	27.6%	78.5%	9.60 (7.60, 12.14)
HCWs are at greater risk than general public of catching H1N1*	59.8%	81.7%	3.02 (2.42, 3.75)
I am at risk of catching pH1N1 from hospital patients *	38.1%	69.2%	3.64 (2.94, 4.52)
Perceived Severity of Influenza			
pH1N1 is dangerous for me*	24.9%	55.7%	3.78 (2.99, 4.79)
pH1N1 is dangerous for the patients in the hospital at which I work*	71.2%	87.9%	2.94 (2.31, 3.74)
pH1N1 is a bad disease*	77.8%	90.1%	2.61 (2.01, 4.0)
If I were to get pH1N1 it would significantly interfere with my regular daily activities*	68.9%	88.0%	3.29 (2.60, 4.18)
Other health problems that I have may become worse if I get pH1N1*	33.7%	44.3%	1.56 (1.26, 1.94)
The thought of getting pH1N1 scares me*	22.5%	48.0%	3.18 (2.50, 4.06)
Perceived Benefits of Vaccination in Preventing Influenza			
If I get vaccinated against pH1N1, then I will be more certain that I will not infect patients*	26.5%	75.8%	8.68 (6.86, 11.00)
If I get vaccinated against pH1N1, then I will be more certain that I will not infect family members*	29.7%	80.9%	10.04 (7.96, 12.66)

Getting the pH1N1 vaccine will prevent me from getting pH1N1*	17.1%	56.0%	6.16 (4.72, 8.05)
Prevent spread of pH1N1*	30.6%	80.4%	9.30 (7.39, 11.71)
The pH1N1 vaccine can NOT cause pH1N1* [R]	52.0%	79.5%	3.58 (2.89, 4.44)
I do not expect any side effects (e.g. local tenderness or infection) from the pH1N1 vaccine*	11.0%	26.7%	2.93 (2.13, 4.04)
I do not expect an allergic reaction or autoimmune disease after getting the pH1N1 vaccine*	28.5%	64.1%	4.47 (3.56, 5.62)
I believe the pH1N1 vaccine is safe*	14.7%	69.6%	13.23 (9.94, 17.59)
Perceived Barriers to Accepting Vaccination			
I have time to get the pH1N1 vaccine*[R]	60.9%	91.0%	6.48 (5.11, 8.21)
pH1N1 vaccine is NOT painful*[R]	38.1%	58.1%	2.25 (1.82, 2.79)
Getting the pH1N1 vaccine does NOT interfere with daily activities*[R]	54.8%	82.2%	3.80 (3.06, 4.72)
I am NOT worried about the side effects of getting the pH1N1 vaccine*[R]	20.8%	56.5%	4.94 (3.84, 6.34)
I am NOT fearful of needles[R]	78.0%	80.4%	1.16 (0.90, 1.49)
I do NOT like getting injections	53.1%	55.1%	1.09 (0.89, 1.35)
The pH1N1 vaccine will NOT make me sick*[R]	28.7%	73.7%	6.95 (5.52, 8.75)
Cues to Action			
People close to HCW think that it is important for me to get the pH1N1 vaccine*	17.9%	61.6%	7.33 (5.63, 9.54)
My colleagues think it is important for me to get the pH1N1 vaccine*	28.7%	60.7%	3.82 (3.04, 4.80)
My doctor encouraged me to get the pH1N1 vaccine*	14.7%	48.0%	5.34 (4.02, 7.10)
My supervisors thought it was a good idea for me to get the pH1N1 vaccine*	45.2%	75.0%	3.63 (2.93, 4.49)
General Attitudes			
All HCWs should be vaccinated against pH1N1*	14.7%	76.0%	18.40 (13.81, 24.52)
It is important that HCWs have freedom of choice in vaccination*	92.4%	69.0%	0.18 (0.13, 0.27)
I believe in immunizations*[R]	47.7%	86.9%	7.30 (5.84, 9.12)

Note: * p-value <0.001
Participants who had completed less than 80% of the HCW pH1N1 Vaccine Attitudes and Knowledge Scale were excluded from the analysis therefore † Data missing for 6 participants and ‡ Data missing for 13 participants from the total sample
[R] Reverse Code for ease of odds ratio interpretation

5.4.4 Modeling factors predictive of pH1N1 vaccination

The factors with ORs having 95% CI excluding 1, were included within the final multivariate logistic regression models are presented in Table 5.4.

5.4.4a Model (1) Base model (excludes H1N1 Attitudes and Knowledge Scale items)

Regression analysis generated AUC, indicative of the model's discriminative power, was 0.84 (CI 0.81, 0.87). That is, the base model of factors correctly predicted 84% of HCW pH1N1 vaccination in the study sample.

5.4.4b Model (2) Base model plus H1N1 Attitudes and Knowledge Scale items

The purpose of this model was to examine whether the addition of the pH1N1 Attitudes and Knowledge Scale items to the base model increased the model's ability to predict pH1N1 vaccination. As seen in Table 5.4, HCW attitudes and beliefs were highly predictive of HCW pH1N1 vaccination, even after accounting for base model predictors. The AUC of this model was 0.95 (CI 0.93, 0.96). This combined model of factors correctly predicted 95% of HCW pH1N1 vaccination behaviour, which is an increase over the base model.

Table 5.4: Multivariate regression analysis, modeling factors predictive of HCW pH1N1 vaccination

Predictor Variables	Base Model‡		Base Model + Attitudes Scale Items†	
	OR	95% CI	OR	95% CI
Sociodemographics				
In a relationship	1.50	(1.04, 2.16)	-	-
Formal religious belief	1.82	(1.28, 2.58)	1.52	(1.00, 2.30)
Type of work: full-time	1.85	(1.31, 2.62)	2.16	(1.41, 3.30)
Occupation Classification				
Physicians	1	Reference	1	Reference
Nursing	0.31	(0.07, 1.31)	0.46	(0.07, 2.82)
Allied HCWs	0.43	(0.09, 1.98)	0.64	(0.10, 4.24)
Administrative/clerical	0.23	(0.05, 1.01)	0.33	(0.05, 2.03)
Healthcare technicians	0.47	(0.09, 2.21)	1.09	(0.16, 7.51)
Research and laboratory	0.43	(0.09, 1.98)	0.41	(0.06, 2.74)
Facilities and logistics	0.23	(0.05, 1.09)	0.62	(0.09, 4.27)
Other, non-clinical	0.12	(0.02, 0.55)	0.17	(0.02, 1.21)
Influenza Risk Populations				
Regular contact with children	1.43	(1.02, 2.00)	-	-
Family Member has a chronic illness	1.56	(1.04, 2.36)	-	-
Influenza Vaccine History				
Past side-effects to influenza vaccination	0.58	(0.41, 0.83)	-	-
Allergy to vaccine components	0.14	(0.06, 0.31)	0.04	(0.01, 0.12)
2008/09 Seasonal Influenza vaccination	3.10	(2.19, 4.40)	1.48	(0.95, 2.31)
2009/10 Seasonal Influenza vaccination	5.40	(3.48, 8.38)	3.43	(2.06, 5.71)
pH1N1 Vaccine Attitudes and Knowledge Scale Items				
It is very likely that I can infect patients with pH1N1 if I don't get the pH1N1 vaccine	-	-	2.47	(1.49, 4.10)

The H1N1 vaccine IS required for a healthy person[R]	-	-	1.73	(1.12, 2.66)
The thought of getting H1N1 scares me			1.88	(1.20, 2.93)
If I get vaccinated against H1N1, then I will be more certain that I will not infect family members	-	-	2.38	(1.56, 3.65)
I believe the H1N1 vaccine is safe	-	-	2.45	(1.50, 4.01)
I have time to get the H1N1vaccine[R]	-	-	1.94	(1.25, 3.00)
The H1N1 vaccine will NOT make me sick[R]	-	-	1.54	(1.01, 2.35)
People close to me think that it is important for me to get vaccinated against H1N1	-	-	1.83	(1.14, 2.95)
My doctor encouraged me to get the H1N1vaccine	-	-	2.10	(1.20, 3.65)
My supervisor thought it was a good idea for me to get the H1N1 vaccine	-	-	1.86	(1.23, 2.81)
All HCWs should be vaccinated against H1N1	-	-	2.90	(1.73, 4.86)
Area under ROC	***0.84***	***(0.81, 0.87)***	***0.95***	***(0.93, 0.96)***

Note: ‡ Base Model: includes key socio-demographic, influenza infection risk factor, and vaccination history related variables, but excludes pH1N1 Vaccine Attitudes and Knowledge Scale items.

†Base Model plus pH1N1 Vaccine Attitudes and Knowledge Scale items: includes all variables in base model (i.e., socio-demographic, risk factor, vaccination history), and the pH1N1 Vaccine Attitudes Scale items (p-value <0.5).

[R] Reverse Code for ease of odds ratio interpretation.

5.5. Discussion

This study identified key factors predictive of *actual* pH1N1 vaccination in a large sample of Canadian multi-professional HCWs in order to improve future vaccine campaigns and pandemic preparedness. This study is one of the few studies that examined HCW attitudes towards pandemic vaccination, and used attitudinal constructs grounded in a validated theoretical framework. We were especially interested in modifiable attitudes and beliefs driving HCWs to accept the vaccine because these factors can be influenced through vaccination strategies to improve vaccine coverage.

Our study identified highly predictive multivariate models of HCW pH1N1 vaccination and demonstrated the important role that modifiable HCW attitudes and beliefs play in such uptake. Our multi-variable model correctly predicts 95% of HCW pH1N1 vaccination behaviours. The addition of attitudinal factors increased the model's ability to discriminate between vaccinated and non-vaccinated HCWs. In comparison to non-vaccinated HCWs, the vaccinated were more likely to be in a relationship, work full-time, have regular contact with at-risk populations, and have received influenza vaccines in the past. Key modifiable attitudinal factors driving vaccination included: (1) desire to protect family members and patients from pH1N1, (2) the belief that vaccination is important even if one is in good health, (3) confidence in vaccine safety, and (4) supervisor and physician encouragement. HCW pH1N1 vaccination was also motivated by fear and inhibited by misperceptions regarding vaccine safety and the belief of allergy to vaccine components.

Past research supports our findings as it shows that HCWs are more likely to receive (or intend to receive) influenza and pH1N1 vaccinations if they: 1) perceive that they are susceptible to the infection, 2) perceive the infection is severe, 3) perceive the

benefits of vaccination outweigh barriers, and 4) are influenced by positive external cues to action.[6, 8, 9, 10] Our findings extend this research by developing a model to quantify and determine the key attitudes predictive of HCW vaccination.

Similar to our findings, past research has also cited fear of vaccine safety and allergy as a vaccine deterrent.[5, 14,15] However, the incidence of vaccine allergies is greatly inflated among non-vaccinated HCWs compared to vaccinated HCWs, and the prevalence of reported vaccine allergies among non-vaccinated HCWs was greater than that of other HCW populations.[16] Thus, non-vaccinated HCWs may be misinformed about their true risk of vaccine related allergies and helping them rule out their perceived allergy may help reduce their fears about such safety concerns.

5.5.1 Limitations

The following study limitations should be considered when interpreting the findings. There was a time lag between the time of the survey and the peak of the pandemic, which may have influenced HCWs' recall of their responses to the questionnaire items. Although HCWs were assured confidentiality in their questionnaire responses, some HCWs may have decided not to participate in the study or be forthcoming, fearing negative consequences if their identity was revealed. Furthermore, this was a single center study. These factors may limit the external validity (i.e. generalizability) of the study results. Finally, our results illustrate predictive models of vaccine uptake, and do not imply causation. Future research should evaluate the efficacy of novel interventions designed to influence these key HCW modifiable attitudes towards vaccination to examine if they improve vaccine uptake.

5.6. Conclusions

Protecting HCWs and patients from acquiring a transmissible infectious disease is a core value of the Canadian health care system as seen in the efforts placed on patient safety, and in the quality measures that have been developed. Vaccination is the best way to prevent infectious diseases and has had the greatest impact worldwide in reducing disease and mortality. The persistent attitudinal barrier to influenza vaccination has been an ongoing quandary. One response is to impose a mandatory HCW vaccination requirement, which has been considered unpalatable to some employee groups. So, the search for interventions to improve voluntary HCW participation in vaccination continues. Our results suggest that future influenza vaccine campaigns should target HCW attitudes and perceptions to improve vaccine coverage in both pandemic and non-pandemic scenarios. Furthermore, a culture of vaccine promotion in the workplace, characterized by strong consistent messaging from HCWs' supervisors and colleagues to enhance vaccine uptake is important. Finally, physicians play an important role in driving HCW vaccination; thus, strong physician support, encouragement, and leadership will likely be important in the success of future vaccine campaigns.

6.0. Predicting (sINFLU) influenza vaccination among healthcare workers

6.1. Abstract

Background: Annual seasonal influenza vaccination of (HCW) is key component of influenza prevention and control in healthcare settings. Yet, vaccination rates fell below recommended targets during most influenza seasons. This study examines factors influencing HCW sINFLU vaccination in a large, multi-professional Canadian sample. We sought to identify modifiable factors (i.e. attitudes and beliefs) that predict vaccination as these factors can be influenced by future vaccine campaigns to improve vaccine coverage.

Methods: A cross-sectional survey was conducted at a large Canadian tertiary care hospital. HCWs (N=3268) completed measures of demographics, vaccination history, influenza risk factors, and attitudes towards sINFLU vaccination. Of the total sample, 2433 (74.3%) HCWs received the sINFLU vaccine. Multiple logistic regression analyses were used to predict HCW sINFLU vaccination.

Results: Data analysis revealed HCW attitudes towards vaccination significantly predicted vaccine uptake, even after adjusting for demographics, vaccine history, and influenza risk factors. The combined model correctly predicted 89% (CI 0.88-0.91) of HCW sINFLU vaccination. Key modifiable factors driving HCW vaccination include: (1) desire to protect family members and patients, (2) belief that vaccination is important even if one is healthy, (3) not expecting vaccine induced side-effect, (4) having the time to be vaccinated, (5) not considering vaccines to be painful, and (6) supervisor encouragement.

Conclusions: This research identified fundamental reasons why HCWs become vaccinated during non-pandemic influenza seasons and provides direction for future

influenza vaccination programs. Targeting HCW attitudes in influenza vaccine campaigns may improve vaccine coverage. Further, creating a culture of vaccine promotion in the workplace, with enhanced vaccine access and strong messaging from supervisors can improve HCW vaccine coverage.

6.2. Introduction

Seasonal Influenza (sINFLU) is a significant health risk to patient populations, and healthcare workers (HCWs) are a potential source of influenza across healthcare settings.[5, 8-11] Annual sINFLU immunization of HCWs is proven to reduce the pool of infection and minimize the overall burden of healthcare associated influenza.[5, 8-12] Yet, many HCWs opt not to receive sINFLU vaccination leading to vaccine coverage rates notably lower than those recommended.[5, 8-10, 14]

A better understanding of HCW sINFLU vaccination behaviours, through the application of a valid theory of health behaviour change, may facilitate the development of more effective vaccination programs. The Health Belief Model (HBM)[27] , well established theory of health behaviour change, has provided a valuable theoretical framework for understanding attitudes and beliefs driving various health behaviours, including HCW influenza vaccination.[22-27] Thus, this research aims to examine the broad array of factors predicting 2008/2009 sINFLU vaccination of a large scale, multi-professional sample of Canadian HCWs. We were especially interested in the examination of HBM based *modifiable* factors (i.e. attitudes and beliefs) predicting HCW sINFLU vaccination as these factors have the most potential to be influenced by future vaccination programs and pro-vaccination messaging.

It is important to consider influenza vaccination in non-pandemic settings, independent of pandemic influenza, as this practise can lead to a better understanding of differential vaccination behaviours of HCWs during pandemic and non-pandemic influenza seasons. This research aims to inform the development of vaccination programs that improve influenza vaccine coverage among HCW populations.

6.3. Materials and Methods

6.3.1 Study design and participants

This cross-sectional observational study was conducted at one of the largest tertiary care hospitals in Canada. Following the conclusion of the hospital's pH1N1 vaccination campaign in June 2010, all hospital HCWs (N= 10,464) were invited to participate in the study through a mass mail-out. HCWs of the hospital were invited to complete a study questionnaire and submit the completed questionnaire to the hospital's Occupational Health and Safety (OCHS) department to be de-identified; only de-identified questionnaires were accessed by the research team.

6.3.2 Study questionnaire measure

Study participant completed measures on (1) socio-demographics (e.g. age, gender, occupation and department of employment etc.), (2) influenza infection risk factors, (3) influenza vaccine history, and (4) sINFLU vaccine attitudes are included in the analysis *(refer to appendix section A for a copy of the survey).* HCW attitudes towards sINFLU was assessed using a 34-item sINFLU Vaccine Attitudes and Knowledge Scale, adapted from questionnaires developed to measure behaviour determinants associated with influenza vaccination in HCWs [21, 30]. This scale surveys the 5 constructs of the Health Belief Model (HBM), [27](i.e. susceptibility to influenza, severity of influenza, benefits of accepting vaccination, barriers to accepting vaccination, and cues to action), as well as assesses general attitudes of HCWs towards sINFLU vaccination. Participants indicated the extent to which they agree or disagree with scale items on a 5-point Likert scale.

6.3.3 Statistical analysis

All analyses were conducted using SPSS/PASW v.17 statistical package. Data was initially screened and statistical assumptions were evaluated. Descriptive statistics for the study sample (i.e. survey respondents) was calculated and frequency statistics were used to evaluate HCW responses to questionnaire items. The distribution of key socio-demographic variables of the study sample was compared to the overall HCW population (i.e. staff at the institution) for external study validity. HCW reported level of agreement with the sINFLU Vaccine Attitudes and Knowledge Scale items was dichotomized into agree (strongly agree and agree) and disagree (neither agree nor disagree, disagree, and strongly disagree) statements, dichotomy consistent with previous research.[21]

In the previous analysis, self-reported pH1N1 vaccine uptake of HCWs responding to the survey was confirmed using OCHS records and 99.96% concordance was obtained *(refer to section 5).* However, self- reported sINFLU vaccine uptake of the study sample could not be confirmed in the same manner because of incomplete OCHS 2008/2009 vaccination records. Nevertheless, because of the high degree of concordance observed between self-reported and OCHS records for pH1N1 vaccination, in the same HCW sample using the same survey measure, self-reported HCW sINFLU vaccination was considered to be valid measure of *actual* sINFLU vaccination, and treated as such.

Self-reported sINFLU vaccine status was considered the primary outcome of interest. Chi-square analyses, independent samples *t*-tests, and univariate analysis were used to examine differences between vaccinated and non-vaccinated HCWs in terms of socio-demographics, vaccine history, influenza risk factors, and agreement with sINFLU vaccine Attitudes and Knowledge Scale items. Odds Ratios (with 95% confidence

intervals) were calculated to examine associations between independent factors (i.e. socio-demographics, occupation, vaccine history, influenza risk factors, and agreement with sINFLU vaccine Attitudes and Knowledge Scale items) and HCW sINFLU vaccination (self-report).

Multivariate logistic regression analysis using forward stepwise selection of variables was used to model factors predictive of HCW sINFLU vaccination. The inclusion of factors in the multivariate regression analysis process was based on the univariate analysis (statistically significant (p-value <0.1) predictors of sINFLU vaccination and the existing literature on HCW sINFLU influenza vaccination.

It is worth noting that a number of predictive models were developed to better examine associations between predictor variables and self-reported sINFLU vaccination, however only the most robust models are discussed further (*refer to Appendix section F1 for information on the entire range of models generated*).

In an attempt to quantify the ability of sINFLU Vaccine Attitudes and Knowledge Scale items to predict sINFLU vaccination behaviour two independent multivariate models were generated. All factors found to be statistically significant predictors of HCW sINFLU vaccination (p-value <0.05) were included in the final models:

Model (1) Base Model (includes key socio-demographic, influenza infection risk factor, and vaccination history related variables, but excludes sINFLU Vaccine Attitudes and Knowledge Scale items), and

Model (2) Base Model plus sINFLU Vaccine Attitudes and Knowledge Scale items (includes all variables in the base model and sINFLU Vaccine Attitudes and Knowledge Scale items (p-value <0.5, OR CI excludes 1). The discriminative power of

both models to correctly classify HCW sINFLU vaccination was assessed using AUC (i.e. area under the receiver operating (ROC) curve).

Similar statistical analysis techniques were previously used to determine factors predictive of actual pH1N1 vaccination in the same HCW sample *(refer to thesis section 5).*

6.4. Results

6.4.1 Study sample characteristics

A total of 10464 survey packages were distributed to hospital staff and 3301 packages were completed, yielding a response rate of 31.5%. Of these 3268 surveys were sufficiently completed (i.e. sINFLU vaccination status reported) and included in the data analysis. The distribution of the study sample's gender and occupation group was found to be comparable to that of the overall HCW population when verified with administrative staffing records.

2008/2009 sINFLU vaccination was reported by 3268 HCW participants, a total of 2433 (74%) HCWs received the 2008/2009 sINFLU vaccine, while 835 (25 %) remained unvaccinated. The average age of the study sample was 42.9 years (SD=11.25), and the majority of HCWs were women (81%), and nurses (35%). Additionally, 87.4% of HCWs reported receiving the 2009/2010 pH1N1 influenza vaccine, and 53.8% of HCWs reported 2009/2010 seasonal influenza vaccination. Socio-demographics characteristics of the study sample are presented in Table 6.1.

Table 6.1: Socio-demographic characteristics of HCW study sample (N=3268)

Characteristics	N (%)‡
Sociodemographics	
Mean Age	42.93 +/- 11.23
Sex: Female	2608 (81.4%)
Ethnic background: Caucasian	2884 (89.3%)
Formal Religious belief†	2516 (76.2%)
Relationship status: in a relationship	2454 (75.9%)
Dependent children < 21 years of age	1556 (48.8%)
Type of work: full-time	2335 (71.7%)
Occupation Classification	
Nursing	1153 (35.2%)
Physicians	172 (5.3%)
Allied HCWs	361 (11.0%)
Administrative/clerical	721 (22.0%)
Healthcare technicians	241 (7.4%)
Research and laboratory	276 (8.4%)
Facilities and logistics	216 (6.6%)
Other, non-clinical	135 (4.1%)
Vaccine Uptake	
H1N1 influenza vaccination	2862 (87.4%)
2008/09 Seasonal influenza vaccination	2433 (74.3%)
2009/10 Seasonal influenza vaccination	1745 (53.8%)

Note: ‡Cumulative percentage, accounts for missing data points/values
†Includes self-report of belonging to any religious faith (e.g. Christian, Jewish, Muslim, Buddhist, etc.)

6.4.2 Predictors of sINFLU Vaccination among HCWs

Socio-demographic, influenza risk factors, and vaccine history predictors of sINFLU vaccination are presented in Table 6.2. Compared to sINFLU non-vaccinators, HCWs who reported receiving the sINFLU vaccine were older, state formal religious beliefs, and report working in full-time clinical HCW roles (p-value <0.05). Vaccinated HCWs were also more likely to have received pH1N1 and 2009/2010 seasonal influenza vaccines (p-value <0.001), in comparison to the non-vaccinated. Vaccinated HCWs also indicated regular contact with children or the elderly, and reported to have a family member or be personally living with a chronic health condition, more frequently than non-vaccinated HCWs (p-value <0.05). A greater proportion of sINFLU non-vaccinated HCWs also cite side-effects to eggs or allergies to vaccine components, when compared to HCWs receiving the vaccine (p-value <0.001). Neither perceived quality of self-health nor a previous influenza infection (self-reported) was found to be predictive of sINFLU vaccination status (p-value >0.05).

Table 6.2: Socio-demographic, influenza risk factors, and vaccine history predictors of HCW sINFLU vaccine uptake

Characteristics	Did not receive sINFLU vaccine (n=835)	Received sINFLU vaccine (n=2433)	p-value
Sociodemographics			
Mean Age	40.1 +/- 10.98	44.0 +/- 11.14	<0.001
Sex: Female	82.1%	81.2%	0.54
Ethnic background: Caucasian	90.2%	89.1%	0.38
Formal religious belief	71.7%	77.3%	0.002
In a relationship	75.2%	76.2%	0.53
Dependent children < 21 years of age	48%	49.1%	0.54
Children living at home	49.4%	52%	0.20
Type of work: full-time	66.4%	73.7%	<0.001
Occupation Classification			
Nursing	27.8%	37.8%	<0.001
Physicians	2.0%	6.4%	<0.001
Allied HCWs	10.5%	11.2%	<0.001
Administrative/clerical	26.5%	22.5%	<0.001
Healthcare technicians	9.1%	6.7%	<0.001
Research and laboratory	10.9%	7.6%	<0.001
Facilities and logistics	7.4%	6.2%	<0.001
Other-non-clinical	5.7%	3.6%	<0.001
Influenza Infection Risk Factors			
Regular contact with children	58.3%	62.3%	<0.04
Regular contact with the elderly	47.9%	61.4%	<0.001
Living with someone with a chronic illness	8.9%	15.0%	<0.001
Family member has a chronic illness	21.5%	28.2%	<0.001
Personally has a chronic illness	8.9%	15.1%	<0.001
Influenza History			
Past side-effects to influenza vaccination	25.3%	23.7%	<0.001
Egg-allergy	2.4%	0.4%	<0.001
Allergy to vaccine components	5.2%	0.5%	<0.001
Previous influenza infection	38.7%	41.8%	0.12
Perceived self health			
Poor	0.5%	0.2%	0.575
Fair	2.3%	2.9%	
Good	22.9%	23.0%	
Very good	41.3%	42.2%	
Excellent	33.0%	31.6%	
Vaccine Uptake			
pH1N1 influenza vaccination	62.6%	95.9%	<0.001
2009/10 Seasonal Influenza vaccination	10.4%	68.8%	<0.001

6.4.3 HCW sINFLU vaccine Attitudes and Knowledge Scale item predictors (HBM constructs)

The odds ratios (OR) with 95% confidence intervals, the proportion of vaccinated and non-vaccinated HCWs agreeing with each sINFLU Vaccine Attitudes and Knowledge Scale item are presented in Table 6.3

6.4.3a Perceived susceptibility

Perceptions of sINFLU infection susceptibility were associated with vaccination. Vaccinated HCWs were more likely to agree sINFLU vaccination is a requirement even for healthy persons, when compared to non-vaccinated HCWs. Vaccinated HCWs were also more likely to believe sINFLU vaccination would reduce their personal susceptibility to sINFLU infection, and reduce infection transmission to their patients. Furthermore, in comparison to the non-vaccinated, vaccinated HCWs were more likely to agree they were 1) at high personal risk of sINFLU, 2) at risk of catching sINFLU from patients, and 3) at greater overall risk of sINFLU infection than the general public.

6.4.3b Perceived severity

Vaccine uptake was highest among HCWs who agreed with statements relating to sINFLU severity. In comparison to non-vaccinated HCWs, HCWs reporting sINFLU vaccination were more likely to agree a sINFLU infection would: 1) be personally dangerous, 2) interfere with their daily activities, 3) be dangerous to hospital patients, 4) exacerbate their pre-existing health problems, and 5) be a bad disease. Additionally, a greater proportion of vaccinated HCWs were scared by the prospect of being infected, when compared to the non-vaccinated.

6.4.3c Perceived benefits of sINFLU vaccination

HCWs accepting the vaccine believed the sINFLU vaccine was safe. Other benefits that encouraged HCW vaccination against sINFLU include: 1) preventing sINFLU infection transmission to family members, 2) preventing sINFLU spread, 3) preventing sINFLU transmission to patients, and 4) preventing sINFLU infection in self. It is important to note, the association between HCW agreement of protecting self from sINFLU by vaccination and sINFLU vaccination, was weaker in comparison to the association between sINFLU vaccine uptake and agreement with items relating to protecting family members or patients from sINFLU.

6.4.3d Perceived barriers to sINFLU vaccination

Barriers with the strongest associations to sINFLU vaccination were getting sick from the vaccine and vaccine associated side effects. In other words, vaccinated HCWs were more likely to agree the sINFLU vaccine would NOT make them sick or that they were NOT worried about sINFLU vaccine related side effects, compared to sINFLU non-vaccinators. Additional barriers to HCW sINFLU vaccination include: 1) lack of time to be vaccinated, 2) vaccination interfering with one's daily activities, 3) vaccination being painful, and 4) being fearful of needles. However, agreement with statements relating to not liking injections did not differentiate between sINFLU vaccinated and non-vaccinated.

6.4.3e Cues to action

Compared to non-vaccinated, HCWs self-reporting sINFLU vaccination were more likely to agree their vaccine uptake was important to people close to them, such as their spouse, family and friends. Vaccine acceptors also perceived their sINFLU vaccine uptake was 1) encouraged by their physicians, 2) important to colleagues, and 3) supported by their supervisors.

6.4.3f Attitudes towards vaccination

General attitudes of HCWs towards vaccination, independent of the HBM, were also examined by the sINFLU Vaccine Attitude measure. The belief that all HCWs should be vaccinated against sINFLU demonstrated the strongest affinity to sINFLU vaccination. In other words, when compared to the non-vaccinated, a greater proportion of vaccinated HCWs agreed all HCWs should be vaccinated against sINFLU more than any other questionnaire item. Conversely, non-vaccinated HCWs were more likely to believe HCWs should have freedom of choice concerning sINFLU vaccination, in comparison to their vaccinated colleagues. Belief in immunization was also a strong predictor of sINFLU vaccination.

Table 6.3: HCW sINFLU Vaccine Attitudes and Knowledge Scale item predictors of HCW sINFLU vaccine uptake

Factor	Did not receive sINFLU vaccine (n=820)†	Received sINFLU vaccine (n=2406)‡	Odds Ratio (95%CI)
Perceived Susceptibility to Influenza			
I am at high personal risk for getting sINFLU*	17.8%	44.2%	3.66 (3.01, 4.45)
It is very likely that I can infect patients with sINFLU if I don't get the sINFLU vaccine*	21.2%	59.6%	5.49 (4.55, 6.61)
I am likely to get sINFLU if I do not get the sINFLU vaccine*	8.0%	36.3%	6.50 (4.99, 8.48)
The pH1N1 vaccine IS required for a healthy person* [R]	28.5%	72.4%	6.57 (5.51, 7.83)
HCWs are at greater risk than general public of catching sINFLU*	56.3%	78.0%	2.74 (3.32, 3.25)
I am at risk of catching sINFLU from hospital patients*	36.0%	63.1%	3.04 (2.57, 3.58)
Perceived Severity of Influenza			
sINFLU is dangerous for me*	13.8%	30.4%	2.73 (2.20, 3.39)
sINFLU is dangerous for the patients in the hospital at which I work*	72.6%	86.0%	2.31 (1.91, 2.80)
sINFLU is a bad disease*	64.6%	77.5%	1.89 (1.59, 2.24)
If I were to get sINFLU it would significantly interfere with my regular daily activities*	66.3%	82.9%	2.46 (2.06, 2.94)
Other health problems that I have may become worse if I get sINFLU*	27.3%	42.6%	1.97 (1.66, 2.35)
The thought of getting sINFLU scares me*	12.2%	18.8%	1.67 (1.32, 2.10)
Perceived Benefits of Vaccination in Preventing Influenza			
If I get vaccinated against sINFLU, then I will be more certain that I will not infect patients*	36.3%	74.5%	5.11 (4.31, 6.05)

If I get vaccinated against sINFLU, then I will be more certain that I will not infect family members*	37.1%	77.5%	5.84 (4.92, 6.93)
Getting the sINFLU vaccine will prevent me from getting sINFLU*	18.3%	44.8%	3.63 (2.98, 4.40)
Prevent spread of sINFLU*	38.2%	77.5%	5.58 (4.71, 6.62)
The sINFLU vaccine can NOT cause sINFLU*[R]	49.3%	72.7%	2.74 (2.32, 3.23)
I do not expect any side effects (e.g. local tenderness or infection) from the sINFLU vaccine*	16.1%	32.8%	2.54 (2.07, 3.12)
I do not expect an allergic reaction or autoimmune disease after getting the pH1N1 vaccine*	37.8%	68.4%	3.56 (3.01, 4.19)
I believe the sINFLU vaccine is safe*	37.0%	79.8%	6.74 (5.67, 8.01)
Perceived Barriers to Accepting Vaccination			
I have time to get the sINFLU vaccine*[R]	70.0%	90.0%	3.87 (3.17, 4.72)
sINFLU vaccine is NOT painful*[R]	52.0%	65.9%	1.79 (1.52, 2.10)
Getting the sINFLU vaccine does NOT interfere with daily activities*[R]	68.4%	86.3%	2.91 (2.41, 3.52)
I am NOT worried about the side effects of getting the sINFLU vaccine*[R]	35.7%	72.7%	4.78 (4.04, 5.66)
I am NOT fearful of needles*[R]	74.4%	80.7%	1.44 (1.19, 1.73)
I do NOT like getting injections	55.9%	57.9%	1.09 (0.93, 1.27)
The sINFLU vaccine will NOT make me sick*[R]	44.1%	79.7%	4.95 (4.18, 5.87)
Cues to Action			
People close to HCW think that it is important for me to get the sINFLU vaccine*	19.0%	58.8%	6.07 (5.00, 7.35)
My colleagues think it is important for me to get the sINFLU vaccine*	26.8%	56.8%	3.58 (3.01, 4.26)
My doctor encouraged me to get the sINFLU vaccine*	23.0%	54.7%	4.04 (3.37, 4.84)
My supervisors thought it was a good idea for me to get the sINFLU vaccine*	46.2%	73.1%	3.16 (2.68, 3.73)

General Attitudes			
All HCWs should be vaccinated against sINFLU*	20.6%	72.9%	10.36 (8.56, 12.5)
It is important that HCWs have freedom of choice in vaccination*	90.4%	69.6%	0.24 (0.19, 0.31)
I believe in immunizations*[R]	55.5%	88.1%	5.95 (4.94, 7.15)

Note: * p-value <0.001
Participants who had completed less than 80% of the HCW sINFLU Vaccine Attitudes and Knowledge Scale were excluded from the analysis therefore † Data missing for 15 participants and ‡ Data missing for 27 participants from the total sample
[R] Reverse Code for ease of odds ratio interpretation

6.4.4 Modeling factors predictive of sINFLU vaccination

Univarate and multivariate regression analysis was used to model factors predictive of sINFLU vaccination in our HCW sample. The OR with 95% confidence intervals of all factors included within the final multivariate logistic regression models are presented in Table 6.4.

6.4.4a Base model (excludes sINFLU Attitudes and Knowledge Scale items)

Predictors of HCW sINFLU vaccination included in the base regression model are: HCW age (categorical), the type of HCW occupation, regular contact with the elderly, as well as the receipt of 2009/2010 pandemic and seasonal influenza vaccines. Previous side-effects to influenza vaccination (self-report) was associated with sINFLU non-vaccination. AUC, indicative of the model's discriminative power, was 0.85 (0.83, 0.87). Thus, the base model of factors, accurately predicted 85% of sINFLU vaccination within our HCW sample.

6.4.4b Base model plus sINFLU Attitudes and Knowledge Scale items (HBM Constructs)

The purpose of this model was to determine if the incorporation of sINFLU Attitudes and Knowledge Scale items into the base model would increase the model's ability to predict sINFLU vaccine uptake. As seen in Table 6.4, the final model was highly predictive of HCW sINFLU vaccination behaviour, even after accounting for the base model predictors. In fact, the AUC of this final model was 0.89 (0.88, 0.91). As such, this combined model of factors correctly predicted 89% of sINFLU vaccination within our study sample.

When HCW agreement with sINFLU Attitudes and Knowledge Scale items were incorporated into the base model, HCW age (categorical), occupation type, regular contact with the elderly, past allergy to vaccine components (self-report), and 2009/2010 sINFLU vaccination remained as significant predictors of vaccination. The modifiable factors found to be predictive of HCW sINFLU vaccination, above socio-demographic variables include, 1) belief that all HCWs should be vaccinated against sINFLU, 2) belief that sINFLU vaccination is important even if one is in good health, 3) agreement that the likelihood increases in the absence of sINFLU vaccination, 4) desire to protect family members and patients from sINFLU, 5) encouragement to become vaccinated by supervisors and other persons close to the HCW, 6) not expecting vaccine induced side-effects, and 7) considering sINFLU vaccination to NOT be painful.

Table 6.4: Multivariate regression analysis, modeling factors predictive of HCW sINFLU vaccination

Predictor Variables	Base Model ‡		Base Model + Attitudes Scale Items†	
	OR	95% CI	OR	95% CI
Sociodemographics				
Age <20 years	1	Reference	1	Reference
Age 21-30 years	1.08	(0.29, 4.22)	1.77	(0.45, 6.87)
Age 31-40 years	1.10	(0.28, 4.28)	1.60	(0.41, 0.62)
Age 41-50 years	1.58	(0.41, 6.14)	2.68	(0.69, 10.4)
Age 51-60 years	2.31	(0.69, 17.36)	7.34	(1.36, 39.69)
Occupation Classification				
Physicians	1	Reference	1	Reference
Nursing	1.07	(0.55, 2.10)	1.88	(0.89, 4.04)
Allied HCWs	0.57	(0.28, 1.17)	1.07	(0.48, 2.40)
Administrative/clerical	0.72	(0.37, 1.43)	1.02	(0.48, 2.19)
Healthcare technicians	0.46	(0.22, 0.97)	0.87	(0.38, 2.01)
Research and laboratory	0.66	(0.31, 1.39)	0.99	(0.43, 2.27)
Facilities and logistics	0.42	(0.19, 0.90)	0.71	(0.30, 1.69)
Other, non-clinical	0.56	(0.24, 1.32)	0.67	(0.25, 1.75)
Influenza Risk Populations				
Regular contact with elders	1.33	(1.04, 1.69)	1.34	(1.02, 1.74)
Influenza Vaccine History				
Allergy to vaccine components	0.09	(0.03, 0.25)	0.09	(0.03, 0.26)
pH1N1 Influenza vaccination	3.16	(2.24, 4.45)	-	-
2009/10 Seasonal Influenza vaccination	10.12	(7.66, 13.4)	5.88	(4.34, 7.96)
sINFLU Vaccine Attitudes and Knowledge Scale Items				
It is very likely that I can infect patients with sINFLU if I don't get the sINFLU vaccine	-	-	1.33	(0.99, 1.79)

I am likely to get sINFLU if I don't get the sINFLU vaccine	-	-	1.66	(1.12, 2.46)
The sINFLU vaccine IS required for a healthy person [R]			1.91	(1.45, 2.53)
If I get vaccinated against sINFLU, then I will be more certain that I will not infect family members	-	-	1.49	(1.13, 1.97)
I don't expect an allergic reaction after getting the sINFLU vaccine	-	-	1.42	(1.07, 1.88)
sINFLU vaccine is painful	-	-	0.70	(0.53, 0.93)
I am NOT worried about the side-effects of getting the sINFLU vaccine [R]	-	-	2.19	(1.65, 2.91)
People close to me think that it is important for me to get vaccinated against sINFLU			1.57	(1.15, 2.13)
My supervisor thought it was a good idea for me to get the sINFLU vaccine	-	-	1.46	(1.11, 1.92)
All HCWs should be vaccinated against sINFLU	-	-	2.00	(1.47, 3.71)
Area under ROC	***0.85***	***(0.83, 0.87)***	***0.89***	***(0.88, 0.91)***

Note: ‡Base Model: includes key socio-demographic, influenza infection risk factor, and vaccination history related variables, but excludes sINFLU Vaccine Attitudes and Knowledge Scale items.

†Base Model plus sINFLU Vaccine Attitudes and Knowledge Scale items: includes all variables in base model (i.e., socio-demographic, risk factor, vaccination history, and the pH1N1 Vaccine Attitudes and Knowledge Scale items (p-value <0.5).

[R] Reverse Code for ease of odds ratio interpretation.

6.5. Discussion

The primary aim of this study was to improve HCW sINFLU vaccine coverage during non-pandemic seasons via the investigation of factors predictive of sINFLU vaccination uptake in a large sample of multi-professional Canadian HCWs. The strengths of this study lie in the investigation of HCW sINFLU vaccination behaviour by way of attitudinal constructs grounded in validated theory of health behaviour change (HBM). This study has largely focused on modifiable HCW attitudes and beliefs driving vaccination as these factors have the most potential to be influenced by vaccination strategies and pro-vaccination messaging to enhance HCW vaccine coverage.

This analysis identified a highly predictive multivariate model of HCW sINFLU vaccination and demonstrated the role of modifiable HCW attitudes and beliefs in HCW vaccination. The final multi-variable model correctly predicted 89% of HCW sINFLU vaccination behaviour. The addition of attitudinal factors into the base model increased the model's ability to correctly classify between vaccinated and non-vaccinated HCWs. In comparison to non-vaccinated HCWs, vaccine accepters were more likely to be in older, have regular contact with the elderly (i.e. at-risk population), and have received influenza vaccines, and be working in clinical HCW occupations with direct patient contact. Key modifiable attitudinal factors driving vaccination included: (1) belief that ALL HCW should be vaccinated against sINFLU, (2) desire to protect family members and patients from sINFLU, (3) the belief that vaccination is important even if one is in good health, (4) absence of vaccine induced allergies and side-effects, and (5) supervisor encouragement. Conversely, HCW sINFLU vaccination was inhibited by self-reported allergies to vaccine components and pain of vaccination. Since pain of vaccination was found reduce vaccination more efforts

should be placed on educating HCW of the value and utility of influenza vaccines so that more individuals are willing to become vaccinated despite the pain.

Findings consistent with our own have previously been reported by other researchers investigating HCW sINFLU vaccination[5, 8-10, 14,15] HCW who (1) believe themselves and other to be susceptible to influenza, (2) considered influenza to be a serious and severe infection, (3) perceived vaccination benefits to outweigh vaccination barriers, and (4) were motivated by positive cues to action were more likely to become vaccinated.

Future research should look towards the development and evaluation of interventions that specifically influence modifiable attitudes of HCWs to improve sINFLU coverage.

6.5.1 Limitations

A number of possible study limitations must also be recognized in order to fully appreciate the study's findings. Firstly, our study sample represents a multi-professional group of hospital employees at a single healthcare institution; therefore our study findings may not be generalizable to all HCW populations. Secondly, we were unable to confirm self-reported HCW sINFLU vaccination with administrative records, which may have introduced misclassification or reporter bias into the study sample. Thirdly, since all employees of the healthcare institution did not participate in the study (response rate of 35%) our findings may be subjected to sampling bias and the study sample may be a non-random sampling of the underlying HCW population. HCWs may have decided to not participate in the survey as they feared negative consequences for the disclosure of their true vaccination attitudes. Although, we were able to conclude the study sample is comparable to the underlying HCW population by gender and occupation class, the true impact of sampling bias on the final regression analysis cannot be fully assessed. Fourthly, the use of HBM construct based scale items can mean alternative *modifiable* factors not considered by the HBM may not be

apparent in our findings. Lastly, the use of multivariate regression analysis also means causation between vaccination and independent variables cannot be established. Therefore, we cannot confirm HCW attitudes and beliefs, socio-demographics or influenza risk factors lead to particular vaccination behaviours or vice-versa (i.e. HCW vaccination behaviours promote certain attitudes and beliefs about influenza).

6.6. Conclusions

Vaccination remains the most effective and efficient way to prevent influenza in healthcare settings. Thus, continuous efforts are placed on improving HCW and patient influenza vaccination coverage. Our analysis demonstrates modifiable HCW attitudes and beliefs play a key role in sINFLU vaccination and can meaningfully influence vaccination decisions. Therefore, future vaccination programs should look towards HCW attitudes and the creation of pro-vaccination cultures in the workplace to enhance vaccination coverage and reduce the burden of healthcare associated influenza infections on HCWs and patients alike.

7.0. Final Summary and Conclusions

The overall purpose of this study was to investigate the range of factors (i.e. attitudes, beliefs, barriers, motivator, and knowledge gaps) influencing HCW influenza vaccination behaviours. To achieve this goal, 1) a systematic review of the existing pH1N1 literature, 2) a qualitative content analysis of HCW provided motivators and barriers to pH1N1 and sINFLU vaccination, and 3) a quantitative regression analysis of modifiable HCW attitudes predictive of pH1N1 and sINFLU vaccination were undertaken. The use of three distinct study methodologies allowed for 1) a more comprehensive investigation of the entire range of factors driving HCW influenza vaccinations, 2) a better understanding of the similarities and differences between HCW pH1N1 and sINFLU vaccination behaviours, and 3) comparison of qualitative and quantitative study findings in vaccination behaviour research.

7.1. Comparison of HCW pH1N1 and sINFLU Vaccination

Many of the attitudes and factors guiding HCW pH1N1 vaccination were consistently important in all three data analyses (i.e. systematic review, content analysis, and regression analysis), and most factors influencing HCW vaccination were similar for pH1N1 and sINFLU vaccines.

In our literature review we found a greater propensity for pH1N1 vaccination among HCWs who 1) considered pH1N1 to be a serious and severe illness, 2) believed pH1N1 vaccine benefits outweighed possible barriers, 3) were confident of pH1N1 vaccine safety and effectiveness, and 4) were motivated by positive cues to action (i.e. encouragement from others, trust in public health communications, and access of scientific literature). These findings were reaffirmed by the qualitative and quantitative analysis of HCW-pH1N1 study data, and consistent with findings from previous literature reviews on HCW sINFLU vaccination [5, 7, 8-11, 16]

In the qualitative analysis we again determined most motivators and barriers that drove HCW pH1N1 vaccination also drive sINFLU vaccination in non-pandemic seasons. We found HCWs who were 1) concerned about preventing infection in self, family members, patients and communities, 2) aware of a HCW's role in infection transmission, 3) encouraged to become vaccinated by co-workers, 4) open to workplace pro-vaccination initiatives, and 5) accurately informed about vaccination were motivated to become vaccinated. Concerns of vaccine safety and effectiveness, along with the belief that influenza vaccination was not a requirement for healthy persons emerged as key barriers to vaccine uptake. In this analysis, personal motivators and barriers had the greatest impact on HCW pH1N1 and sINFLU vaccination.

In the quantitative analysis process, we found pro-vaccination attitudes and beliefs such as 1) all HCWs require influenza immunizations, 2) influenza immunization being a requirement for healthy adults, 3) vaccination to prevent infection in self, family members and patients, 4) trust in influenza vaccine effectiveness, and 6) encouragement from co-workers/supervisors and family members were predictive of pH1N1 and sINFLU vaccination. A number of socio-demographic variables and influenza risk factors were also found to be predictive of sINFLU and pH1N1 vaccination. Frequent contact with populations at risk of influenza complications, (i.e. elderly, children and persons living with a chronic illness) and prior receipt of other influenza vaccines were important predictors of vaccine uptake. These predictors imply that vaccinated HCW are more conscious of others at increased risk of influenza complications, and may have become vaccinated to prevent infection transfer to these persons. These results suggest future influenza vaccine campaigns should target HCW attitudes driving vaccination, and look towards promoting a culture of

pro-vaccination and altruism in the workplace to improve vaccination in both pandemic and non-pandemic scenarios.

In the HCW-pH1N1 sample, which consisted of a multi-professional sample of HCWs, HCW job type was also a key predictor of pH1N1 and sINFLU vaccination. With respect to sINFLU, HCWs in nursing roles were most likely to become vaccinated, even more so than physicians. Comparatively, individuals working in healthcare administration, research and laboratory roles, healthcare technologist roles, or facilities and logistics (i.e. healthcare support staff) accepted sINFLU vaccination at lower proportions than nurses or physicians. Many of these roles can be considered non-clinical HCW roles with limited direct patient contact. Therefore, non-clinical HCWs may have considered themselves not to be at risk of influenza transmission to or from patients, and decided not to become vaccinated. It may be worthwhile for influenza vaccine campaigns to emphasize that all individuals employed within a healthcare setting should become vaccinated as they can play a role in infection transmission.

Surprisingly, nurses were less willing to accept the pH1N1 influenza vaccination. when compared to other HCW groups (e.g. such as healthcare technicians, allied HCWs, and facilities and logistics personnel .This is especially alarming because nurses represent the majority of healthcare workforce and nurses are often the first point of contact for patients in healthcare settings. A variety of factors could have influenced the observed decrease of pH1N1 vaccination among nurses in our study sample. These may include factors determined to be unique to pH1N1 non-vaccination (i.e. concerns of vaccine safety, limited knowledge of pH1N1 vaccine development and vaccine generated immunity), and is discussed in the following section. However, due to gaps within the existing literature more qualitative research must be done in this area to better understand the influence of HCW role

on differential vaccination in pandemic and non-pandemic settings. This is important so that messaging related to pandemic influenza vaccination can be appropriately targeted among various HCW specialties.

Self-reported allergy to vaccine components inhibited sINFLU and pH1N1 vaccination. This phenomenon may be attributed to HCWs considering vaccine allergies to be a valid and convenient reason for non-vaccination, and citing allergies over their true reasons for non-vaccination. Furthermore, since the incidence of vaccine allergies was inflated among non-vaccinated HCWs compared to vaccinated HCWs, and the prevalence of reported vaccine allergies among non-vaccinated HCWs was greater than that of other HCW populations this predictor should be considered with precaution.[16]

7.1.1a Factors unique to pH1N1 vaccination

The pH1N1 season was markedly different from non-pandemic sINFLU seasons, especially because HCW pH1N1 vaccination was extensively promoted by various health authorities and a large amount of attention was placed on the infection's pandemic nature by various sources (e.g. mass media, political leaders, health authorities and healthcare organizations). Furthermore, a greater proportion of the HCW-pH1N1 study sample was vaccinated against 2009/2010 pH1N1 (87.4%) than 2008/2009 sINFLU (74.3%). Therefore, understanding HCW vaccination in pandemic vs. non-pandemic settings can provide future direction for vaccination campaigns and enhance vaccine uptake. Furthermore, specifically focusing on pH1N1 vaccination can inform the development of evidence-based preparedness plans for future influenza pandemics.

A number of factors were found to be unique to pH1N1 uptake in present study. To our knowledge, none of these factors have previously been reported within HCW sINFLU vaccination literature. These factors include: 1) fear of pH1N1, 2) improved vaccine

accessibility, 3) inconsistent messaging and miscommunication from external sources (i.e. mass media, pharmaceutical agencies, and regulatory bodies), and 4) concerns regarding vaccine safety and effectiveness due to perceptions of rapid vaccine development. Fear and vaccine accessibility positively influenced vaccine uptake, while miscommunications from external sources and perceptions of accelerated vaccine development process had negative implications.

In both the quantitative and qualitative analysis findings, fear of infection that stemmed from pH1N1 epidemiology and pandemic infection spread, led to many HCWs becoming vaccinated against pH1N1. However, fear of infection is not often reported to be an important factor for sINFLU vaccination within the literature, nor was fear found to be a significant predictor of sINFLU vaccination in our quantitative analysis. These findings suggest the observed increase in pH1N1 vaccine coverage in comparison to sINFLU may have been primed by fear towards the pandemic, which was viewed to be a novel infection different from sINFLU. As such, it may be appropriate to assume the infrequency of an influenza pandemic and the attention placed on the pandemic created fear, which resulted in more HCWs becoming immunized.

Accessibility of the pH1N1 vaccine was also found have a positive impact on vaccine uptake, especially in the HCW-pH1N1 study sample. Based on the qualitative analysis findings, HCWs were motivated to become vaccinated against pH1N1 because of shorter line-ups, reduced wait times, and improved vaccine accessibility. In fact, having the time to be vaccinated was predictive of pH1N1 vaccination within the final regression model predicting HCW pH1N1 vaccination. Although vaccine accessibility was not a barrier to sINFLU vaccination in the HCW-pH1N1 sample, lack of time and vaccine accessibility are frequently reported to be barriers to sINFLU vaccination by other studies.[8-11] A literature

review by Thomson et al., found HCWs not vaccinated against sINFLU most frequently reported unsuitable vaccination locations and times as reasons inhibiting their vaccine uptake.[9] Our analysis suggests the improved pH1N1 vaccine coverage may have been the result of improved vaccine accessibility due to pandemic preparedness planning and HCWs being a target group for pH1N1 vaccination. Based on these results, it may be worthwhile to mirror pH1N1 vaccine distribution and promotion processes during future influenza seasons so that vaccine accessibility is no longer a deterrent to HCW influenza vaccination.

A number of additional factors were also found to inhibit pH1N1 vaccination. Even though vaccine induced adverse events and mistrust of the vaccine's effectiveness have previously been reported in sINFLU vaccination research, the idea that vaccine safety and effectiveness was compromised for rapid vaccine development is unique to pH1N1. HCWs felt that the pandemic vaccine was novel and different from sINFLU vaccines, and the R&D processes surrounding this vaccine were rushed to quickly produce a vaccine to respond to the pandemic. This was especially evident in our qualitative analysis and other qualitative studies included in the systematic review.[48,55] Most HCWs not vaccinated against pH1N1 influenza vaccination may have done so because they were not convinced of the safety and effectiveness of the pH1N1 vaccine. Thus, it may be important for vaccination campaigns to educate HCWs on the true risks and benefits of vaccination, as well as vaccine development processes, especially at the onset of an influenza pandemic.

Inconsistent messaging and miscommunication from external sources (i.e. mass media, pharmaceutical agencies, and regulatory bodies) also had a negative impact on pH1N1 vaccination. According to the qualitative analysis findings, HCWs felt the pandemic was somehow manufactured for the benefit of pharmaceutical companies and mishandled by public health and regulatory authorities. In other words, non-vaccinated HCWs felt the

pandemic was exaggerated by external sources for monetary gain or conspiracy, as such did not consider pH1N1 to be a serious and severe infection. Therefore, along with improving vaccine accessibility and convincing HCWs of influenza vaccine safety and effectiveness, future pandemic vaccination campaigns should also look towards developing consistent pro-vaccination messaging to address HCW concerns stemming from media and external source communications. Furthermore, it may be beneficial for vaccination campaigns in healthcare settings to disseminate messaging that address misconceptions about influenza vaccination stemming from external sources.

Socio-demographic and influenza infection risk factors specifically predictive of pH1N1 vaccination included full-time work and self-reported formal religious beliefs. Since full-time HCW spend more time working at the hospital, in comparison to part-time HCWs, these individuals may have become vaccinated because of 1) their increased risk of exposure to pH1N1 due to the amount of time they spend at work, and 2) increased exposure to work-place pro-vaccination policies. Therefore, vaccination programs in healthcare settings may need to specifically target non full-time staff to improve overall vaccine coverage of all HCW staff. We are limited in our ability to comment on the relationship between vaccination and HCW religious beliefs, as the research in this area is sparse. We suggest more research be done in this area to better understand this association. Future researchers .may wish to consider the use of qualitative research to explore the association between HCWs' faith and their vaccination behaviours.

7.1.1b Factors unique to sINFLU vaccination

It is important to consider HCW sINFLU vaccination in comparison to pH1N1 as this practice can also provide additional insight into HCW vaccination behaviours. Although various studies have reported on factors influencing HCW sINFLU influenza vaccination

behaviours, few researchers have linked their findings to HCW vaccination behaviours during the 2009/2010 H1N1 influenza pandemic (pH1N1), when vaccine uptake among HCWs received a significant amount of attention. Additionally, much of the existing research considering both sINFLU and pH1N1 HCW vaccination behaviours remains limited by study population, sample size, and the application of valid health behaviour theories.[34,35,38,46,50,51] thus, reducing our ability to learn from the pH1N1 experience and improve HCW vaccination in non-pandemic settings. This is why studies simultaneously investigating pandemic and non-pandemic vaccination, like the present analysis, are all the more important.

In the HCW-pH1N1 study we were able to investigate factors influencing both sINFLU and pH1N1vacciantion in the same HCW sample using qualitative and quantitative data analysis approaches. This allowed for the more refined investigation of differences between HCW pH1N1 and sINFLU vaccination behaviours.

Not being vaccinated to promote one's "natural immunity", vaccine efficacy questions stemming from sINFLU development processes, and simply not being vaccinated against sINFLU out of habit were determined to be key barriers to sINFLU vaccination in the qualitative analysis. These finding again imply non-vaccinated HCWs tend to be misinformed about immunization, influenza vaccination, and general immune function, and only think of self health when considering sINFLU vaccination. Therefore, future vaccination campaigns should look towards enhancing HCW knowledge of influenza vaccination and general immune function to attempt to convince more HCWs of the utility and effectiveness of sINFLU vaccines.

Surprisingly, pain of vaccination was found to inhibit sINFLU vaccine uptake. Yet, pain did not have a notable influence on HCW pH1N1 vaccination in the same sample.

These findings support the notion that HCWs considered pH1N1 to be more significant than sINFLU and were willing to overlook the pain associated with vaccination in pandemic settings.

7.2. Overall Study Limitations

To fully appreciate the findings of this thesis study a number of possible study limitations must also be considered. It is important to note the following section describes the overarching limitations applicable to this research project, while limitations specific to each data analysis component (i.e. systematic review, content analysis, and regression analysis) are outlined in the appropriate sections..

The use of previously collected study data (HCW-pH1N1 study) may be viewed as a limitation of this research. Typically, study objectives and methodologies are set forth prior to data collection to lessen the potential for an existing dataset to bias a researcher's study objectives and results. However, since the goals and objective of this thesis are closely mirror the goals and objective of the HCW pH1N1 study, which were set forth prior to HCW pH1N1 data collection, we anticipate the secondary nature of the data source to be of minimal consequence to the study

All of the studies included in the systematic review and the HCW-H1N1 study relied on self-reported data drawn from various questionnaire survey measures. This use of self-reported data may have introduced bias, especially because many of these studies were conducted by researchers with support from the respective healthcare institutions (i.e. HCW employer). As a consequence, many non-vaccinated HCWs may have incorrectly stated that they became vaccinated due to concerns of being reprimanded by their employer. As such, we recognize misclassification of vaccinated and unvaccinated HCWs to be a significant limitation of the systematic review's findings, where the majority of the included studies

indicate the use of self-reported data. However, for this HCW- pH1N1 study, the self-reported pH1N1 vaccine status of all survey respondents (i.e. the study sample) was verified with their actual vaccine status using administrative records and 99% concordance was established. Based on the high degree of concordance observed for pH1N1 vaccination, self-reported sINFLU vaccination status of the same HCW sample was assumed to be an accurate measure of actual vaccination during the 2008/2009 influenza seasons. Since HCW participants of the HCW-pH1N1 study accurately reported their influenza vaccination status it is appropriate to assume this study's findings are not meaningfully influenced by misclassification bias.

In a similar context, HCW study participants may have provided plausible and socially acceptable responses for their vaccination and non-vaccinated decisions in an attempt to better validate their vaccination decisions. Such responses may not be reflective of true HCW attitudes and beliefs, and may have introduced additional bias (e.g. reporter bias) into the study's findings. For instance, many HCWs often reported allergies or vaccine induced adverse events in higher proportions than what is standard for most HCW populations. This could have been the result of non-vaccinated HCWs recognizing these factors to be reasonable causes for non-vaccination.

All studies considered by this thesis analysis (i.e. the systematic review and the HCW-pH1N1 study) were based on voluntary HCW participation. The response rates of studies (where reported) were quite variable (9%-100%), with most studies reporting sub-standard participation rates. These studies may have introduced volunteer or participation bias in our findings, if HCW study participation occurred in a non-random manner. Furthermore, studies with low response rates can yield study samples that are not being representative of the underlying HCW population of interest, and thereby limit the

generalizability of a study's findings. We recognize possible issues with generalizability to be a limitation of the HCW-pH1N1 study findings as well as findings of studies included in the systematic review.

This research was heavily based on the HBM and its constructs of perceived severity, susceptibility, benefits, barriers, and cues to action. The HBM was used as an appropriate theory of health behaviour to 1) inform the organization of the systematic review's findings, 2) develop the qualitative coding schemas, and 3) design the HCW-pH1N1 study questionnaire items included as predictor variables in the quantitative analysis.

Other theories of health behaviour, such as the theory of reasoned action, stages of change model, or protection motivation theory, could have been applied to this work as alternatives to the HBM. These theories may have captured alternative motivators and barriers to pH1N1 and sINFLU vaccination which may not be sensitive to the HBM constructs. For example, HCW self-efficacy, ecological and societal factors, or readiness to accept vaccination, concepts considered to be important components of other health behaviour models and theories, may not have been effectively captured by the HBM. Therefore, our findings may not fully capture the entire range of factors with the potential to influence HCW influenza vaccination behaviour.

7.3. Significance of The Study

This project is novel as it incorporates multiple study methodologies and data analysis techniques to define and better understand HCW attitudes, beliefs, barriers, motivators, and knowledge influencing influenza vaccination. The major strength of this project lies in the application of both qualitative and quantitative approaches to answer the research questions of, why HCWs receive and/or not receive influenza vaccination during pandemic and non-pandemic influenza seasons?

The study characteristics mentioned below all contributed to enhancing the significance of our findings.

Factors influencing pandemic influenza vaccination of healthcare workers- A Systematic Review was the first publication to summarized findings from numerous studies reporting on HCW pH1N1 vaccination in a systematic and repeatable manner. It was important to focus on HCW pandemic influenza vaccination as it was not extensively studied prior to pH1N1 season, and numerous researchers had reported their findings on pandemic vaccination behaviours in various HCW populations, following the 2009/2010 pandemic.

In regards to the HCW-pH1N1 study, the use of qualitative and quantitative data analysis strategies to examine factors influencing vaccination behaviours of the same HCW sample is a strength of this research. No other studies report the simultaneous investigation of pH1N1 and sINFLU vaccination using both qualitative and quantitative data analysis techniques. In fact, this study is one of few studies to examine HCW pH1N1 vaccination with a qualitative lens. HCWs were provided the opportunity to report and rank their reasons for vaccine uptake and/or avoidance, instead of choosing options from a pre-selected set of reasons. This practise allowed for the identification of pH1N1 vaccination motivator and barrier themes unique to HCW pandemic influenza vaccination, many of which were only captured by the qualitative analysis and previously unreported by other studies in this area of research.

The use of a valid and applicable theory in health behaviour to guide the investigation of modifiable attitudes and beliefs influencing HCW pH1N1 vaccination (actual) is another strength of this research. The use of HBM meant that modifiable HCW attitudes and beliefs, with the most power to be influenced by pro-vaccination strategies and messaging could be explored to bring about desired behavioural changes (i.e. vaccine uptake).

Finally, the HCW-pH1N1 study is only one of two studies to report the verification of HCW self-reported pH1N1 vaccination status with administrative records.[38,55] This practice allowed us to confirm the accuracy of HCW self-reported vaccination and minimize misclassification bias in a large multi-professional sample of HCWs.

8.0. Recommendations for Future Influenza Vaccination Campaigns

The primary aim of this research was to identify and highlight the key factors driving HCW vaccination during pandemic and non-pandemic influenza seasons, in order to inform vaccination campaigns. Most of our findings have been (or are in the process of being) published in peer reviewed scientific journals, presented at a number of relevant conferences and scientific meetings. This thesis work has accomplished its intended aim of informing future research and policy in the area of HCW influenza vaccination.

The dissemination of our findings will enable policy makers and program developers to establish evidence-based strategies that improve influenza vaccination and infection control in healthcare settings. As such, recommendations for future influenza vaccination programs, based on the findings of this analysis, are outlined below:

- Emphasize the benefits of HCW influenza vaccination (such as influenza prevention in self, family members, patients and others) and address barriers to vaccine uptake (i.e. vaccine safety, vaccine effectiveness, and the occurrence of vaccine induced adverse events)
- Establish a culture of pro-vaccination in the workplace through improved access to influenza vaccine, and encouragement from supervisors, co-workers and organizational leaders
- Develop knowledge dissemination strategies that improve HCW access to scientifically valid, evidence based, consistent, and interpretable information on 1) vaccine R&D processes and vaccine ingredients, 2) natural immune function, 3) vaccine generated immunogenicity, and 4) the true risk and occurrence of vaccine induced adverse events

- Tailor pro-vaccination messages to different HCW groups (i.e. woman, nursing, and other non-clinical HCW occupations) to appropriately address vaccination knowledge gaps, benefits and barriers specific to those groups.
- Design consistent pro-vaccination messaging to combat negative implications various miscommunications from external sources (i.e. mass media, pharmaceutical agencies, and regulatory bodies) can have on vaccination
- Promote altruistic benefits of vaccination (i.e. protection of family, protection of patients, protection of co-workers, protection of community) and herd immunity to enhance HCWs awareness of the positive implications their vaccination uptake can have on preventing infection transfer to at risk populations
- Target modifiable vaccination attitudes and beliefs of HCWs, such as: 1) all individuals employed within a healthcare setting should become immunized against influenza, 2) influenza is a serious and severe disease, 3) influenza vaccination is safe and effective in preventing infection, and 4) vaccination is a requirement even if one is in good health
- Physicians play an important role in driving HCW vaccination; thus, strong physician support, encouragement, and leadership will likely be important in the success of future vaccine campaigns.

The incorporation of these recommendations into vaccination programs may elevate HCW influenza vaccination to the recommended targets of 70-90% coverage.

9.0. References

1. Influenza (Seasonal) Fact Sheet N^{o} 211 [Internet]; c2009 [cited 2012 08/21]. Available from: http://www.who.int.proxy.bib.uottawa.ca/mediacentre/factsheets/fs211/en/.

2. Molinari NA, Ortega-Sanchez IR, Messonnier ML, Thompson WW, Wortley PM, Weintraub E, Bridges CB. The annual impact of seasonal influenza in the US: Measuring disease burden and costs. Vaccine 2007 Jun 28;25(27):5086-96.

3. Ryan J, Zoellner Y, Gradl B, Palache B, Medema J. Establishing the health and economic impact of influenza vaccination within the european union 25 countries. Vaccine 2006 Nov 17;24(47-48):6812-22.

4. Monto AS. Seasonal influenza and vaccination coverage. Vaccine 2010 Sep 7;28 Suppl 4:D33-44.

5. Burls A, Jordan R, Barton P, Olowokure B, Wake B, Albon E, Hawker J. Vaccinating healthcare workers against influenza to protect the vulnerable--is it a good use of healthcare resources? A systematic review of the evidence and an economic evaluation. Vaccine 2006 May 8;24(19):4212-21.

6. Bridges CB, Kuehnert MJ, Hall CB. Transmission of influenza: Implications for control in health care settings. Clin Infect Dis 2003 Oct 15;37(8):1094-101.

7. Nichol KL. Efficacy and effectiveness of influenza vaccination. Vaccine 2008 Sep 12;26 Suppl 4:D17-22.

8. Poland GA, Tosh P, Jacobson RM. Requiring influenza vaccination for health care workers: Seven truths we must accept. Vaccine 2005 Mar 18;23(17-18):2251-5.

9. Thomas RE, Jefferson T, Lasserson TJ. Influenza vaccination for healthcare workers who work with the elderly. Cochrane Database Syst Rev 2010 Feb 17;(2)(2):CD005187.

10. Lam PP, Chambers LW, MacDougall DM, McCarthy AE. Seasonal influenza vaccination campaigns for health care personnel: Systematic review. CMAJ 2010 Sep 7;182(12):E542-8.

11. Music T. Protecting patients, protecting healthcare workers: A review of the role of influenza vaccination. Int Nurs Rev 2012 Jun;59(2):161-7.

12. National Advisory Committee on Immunization (NACI). Statement on influenza vaccination for the 2008-2009 season. an advisory committee statement (ACS). Can Commun Dis Rep 2008 Jul;34(ACS-3):1-46.

13. Fiore A.E. Fry A. Shay D. Gubareva L. Bresee J.S. Uyeki T.M. Centers for Disease Control and Prevention (CDC). Antiviral agents for the treatment and chemoprophylaxis

of influenza --- recommendations of the advisory committee on immunization practices (ACIP). MMWR.Surveillance Summaries : Morbidity and Mortality Weekly Report.Surveillance Summaries / CDC 2011 21 Jan 2011;60(1):1-24.

14. Potter J, Stott DJ, Roberts MA, Elder AG, O'Donnell B, Knight PV, Carman WF. Influenza vaccination of health care workers in long-term-care hospitals reduces the mortality of elderly patients. J Infect Dis 1997 Jan;175(1):1-6.

15. Sartor C, Zandotti C, Romain F, Jacomo V, Simon S, Atlan-Gepner C, Sambuc R, Vialettes B, Drancourt M. Disruption of services in an internal medicine unit due to a nosocomial influenza outbreak. Infect Control Hosp Epidemiol 2002 Oct;23(10):615-9.

16. Poland GA. The 2009-2010 influenza pandemic: Effects on pandemic and seasonal vaccine uptake and lessons learned for seasonal vaccination campaigns. Vaccine 2010 September 2010;28(SUPPL. 4):3-13.

17. Pandemic influenza preparedness and response a WHO guidance document 2009 [Internet]; c2009 [cited 2012 08/21]. Available from: http://www.who.int/influenza/resources/documents/pandemic_guidance_04_2009/en/index.html.

18. Zarocostas J. Healthcare workers should get top priority for vaccination against A/H1N1 flu, WHO says. BMJ 2009 Jul 15;339:b2877.

19. National Center for Immunization and Respiratory Diseases,CDC.Centers for Disease Control and Prevention (CDC). Use of influenza A (H1N1) 2009 monovalent vaccine: Recommendations of the advisory committee on immunization practices (ACIP), 2009. MMWR Recomm Rep 2009 Aug 28;58(RR-10):1-8.

20. Kendal AP, MacDonald NE. Influenza pandemic planning and performance in canada, 2009. Can J Public Health 2010 Nov-Dec;101(6):447-53.

21. Looijmans-van den Akker I, van Delden JJ, Verheij TJ, van Essen GA, van der Sande MA, Hulscher ME, Hak E. Which determinants should be targeted to increase influenza vaccination uptake among health care workers in nursing homes? Vaccine 2009 Jul 23;27(34):4724-30.

22. Blue CL, Valley JM. Predictors of influenza vaccine. acceptance among healthy adult workers. AAOHN J 2002 May;50(5):227-33.

23. Montano DE. Predicting and understanding influenza vaccination behavior. alternatives to the health belief model. Med Care 1986 May;24(5):438-53.

24. Janz NK BM. The health belief model: A decade late. Helath Education & Behavior 1984;11(1):1-47.

25. Brewer NT, Chapman GB, Gibbons FX, Gerrard M, McCaul KD, Weinstein ND. Meta-analysis of the relationship between risk perception and health behavior: The example of vaccination. Health Psychol 2007 Mar;26(2):136-45.

26. Becker M. The health belief model and personal health behavior. Health Education Monographs 1974;2:324-508.

27. Rosenstock I. The health belief model and preventive behaviour. Health Education Monographs 1974;2:27-59.

28. Centers for Disease Control and Prevention (CDC). Prevention and control of influenza with vaccines: Recommendations of the advisory committee on immunization practices (ACIP) - united states, 2012-13 influenza season. MMWR Morb Mortal Wkly Rep 2012 Aug 17;61:613-8.

29. Shahrabani S, Benzion U, Yom Din G. Factors affecting nurses' decision to get the flu vaccine. Eur J Health Econ 2009 May;10(2):227-31.

30. Mok E, Yeung SH, Chan MF. Prevalence of influenza vaccination and correlates of intention to be vaccinated among hong kong chinese. Public Health Nurs 2006 Nov-Dec;23(6):506-15.

31. Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gotzsche PC, Ioannidis JP, Clarke M, Devereaux PJ, Kleijnen J, Moher D. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: Explanation and elaboration. J Clin Epidemiol 2009 Oct;62(10):e1-34.

32. Blasi F, Palange P, Rohde G, Severin T, Cornaglia G, Finch R. Healthcare workers and influenza vaccination: An ERS-ESCMID web-based survey. Clin Microbiol Infect 2011 Aug;17(8):1223-5.

33. Chor JSY, Pada SK, Stephenson I, Goggins WB, Tambyah PA, Clarke TW, Medina M, Lee N, Leung TF, Ngai KLK, et al. Seasonal influenza vaccination predicts pandemic H1N1 vaccination uptake among healthcare workers in three countries. Vaccine 2011 06 October 2011;29(43):7364-9.

34. Amodio E, Tramuto F, Maringhini G, Asciutto R, Firenze A, Vitale F, Costantino C, Calamusa G. Are medical residents a "core group" for future improvement of influenza vaccination coverage in health-care workers? A study among medical residents at the university hospital of palermo (sicily). Vaccine 2011 Oct 19;29(45):8113-7.

35. Opstelten W, van Essen GA, Heijnen M-, Ballieux MJP, Goudswaard AN. High vaccination rates for seasonal and pandemic (A/H1N1) influenza among healthcare workers in dutch general practice. Vaccine 2010 August 2010;28(38):6164-8.

36. Corace K, Prematunga C, Mccarthy A, Roth V, Hayes T, Suh KN, Balfour L, Garber G. Why did health care workers refuse the pH1N1 vaccine during the pandemic?. Canadian Journal of Infectious Diseases and Medical Microbiology.Conference: AMMI Canada-CACMID 2011 Annual Conference Abstracts Montreal, QC Canada.Conference Start: 20110407 Conference End: 20110409.Conference Publication: (Var.Pagings) 2011 Spring 2011;22:13A.

37. Corace K, M., Prematunga C, B., McCarthy A, E., Roth V, R., Hayes T, Suh K, N., Balfour L, Garber G, E. Motivators and barriers to pH1N1 vaccine uptake among healthcare workers. Am J Infect Control 2011 06;39(5):E75-.

38. Kraut A, Graff L, McLean D. Behavioral change with influenza vaccination: Factors influencing increased uptake of the pandemic H1N1 versus seasonal influenza vaccine in health care personnel. Vaccine 2011 Oct 26;29(46):8357-63.

39. Alkuwari MG, Aziz NA, Nazzal ZAS, Al-Nuaimi SA. Pandemic influenza A/H1N1 vaccination uptake among health care workers in qatar: Motivators and barriers. Vaccine 2011 2011;29(11):2206-11.

40. Hakim H, Gaur AH, McCullers JA. Motivating factors for high rates of influenza vaccination among healthcare workers. Vaccine 2011 Aug 11;29(35):5963-9.

41. Prevost P, Daveluy A, Moore N, Miremont-Salame G, Haramburu F. Vaccination campaign against A(H1N1)v influenza: The point of view of the team of the department of pharmacology of bordeaux. Fundamental and Clinical Pharmacology.Conference: 14th Annual Meeting of the French Society of Pharmacology and Therapeutics, the 77th Annual Meeting of the Society of Physiology, the 31st Pharmacovigilance Meeting, the 11th APNET Seminar and Th(TRUNCATED) 2010 April 2010;24:93.

42. Savas E, Tanriverdi D. Knowledge, attitudes and anxiety towards influenza A/H1N1 vaccination of healthcare workers in turkey. BMC Infect Dis 2010 Sep 23;10:281.

43. Seale H, Kaur R, Wang Q, Yang P, Zhang Y, Wang X, Li X, Zhang H, Zhang Z, MacIntyre CR. Acceptance of a vaccine against pandemic influenza A (H1N1) virus amongst healthcare workers in beijing, china. Vaccine 2011 Feb 11;29(8):1605-10.

44. Sevencan F, Ertem M, Ozcullu N, Dorman V, Kubat NK. The evaluation of the opinions and attitudes of healthcare personnel of the province diyarbakir against influenza A (H1N1) and the vaccination. Hum Vaccin 2011 Sep;7(9):945-51.

45. Tagajdid R, Annaz HE, Doblali TK, Sefiani K, Belfquih B, Mrani S. Healthcare worker acceptance of pandemic (H1N1) 2009 vaccination, morocco. Emerging Infectious Diseases 2010 October 2010;16(10):1638-9.

46. Tanguy M, Boyeau C, Pean S, Marijon E, Delhumeau A, Fanello S. Acceptance of seasonal and pandemic a (H1N1) 2009 influenza vaccination by healthcare workers in a french teaching hospital. Vaccine 2011 Jun 6;29(25):4190-4.

47. Torun SD, Torun F. Vaccination against pandemic influenza A/H1N1 among healthcare workers and reasons for refusing vaccination in istanbul in last pandemic alert phase. Vaccine 2010 Aug 9;28(35):5703-10.

48. Hidiroglu S, Ay P, Topuzoglu A, Kalafat C, Karavus M. Resistance to vaccination: The attitudes and practices of primary healthcare workers confronting the H1N1 pandemic. Vaccine 2010 Nov 29;28(51):8120-4.

49. Stavroulopoulos A, Stamogiannos G, Aresti V. Pandemic 2009 influenza H1N1 virus vaccination: Compliance and safety in a single hemodialysis center. Ren Fail 2010 2010;32(9):1044-8.

50. Virseda S, Restrepo MA, Arranz E, Magan-Tapia P, Fernandez-Ruiz M, de la Camara AG, Aguado JM, Lopez-Medrano F. Seasonal and pandemic A (H1N1) 2009 influenza vaccination coverage and attitudes among health-care workers in a spanish university hospital. Vaccine 2010 Jul 5;28(30):4751-7.

51. Sanchez-Paya J, Hernandez-Garcia I, Garcia-Roman V, Camargo-Angeles R, Barrenengoa-Sanudo J, Villanueva-Ruiz CO, Martinez HR, Gonzalez-Hernandez M. Influenza vaccination among healthcare personnel after pandemic influenza H1N1. Vaccine 2011 Dec 7.

52. Ahmed GY, Balkhy HH, Bafaqeer S, Al-Jasir B, Althaqafi A. Acceptance and adverse effects of H1N1 vaccinations among a cohort of national guard health care workers during the 2009 hajj season. BMC Res Notes 2011;4:61.

53. Hofmann F, Ferracin C, Marsh G, Dumas R. Influenza vaccination of healthcare workers: A literature review of attitudes and beliefs. Infection 2006 Jun;34(3):142-7.

54. Hollmeyer HG, Hayden F, Poland G, Buchholz U. Influenza vaccination of health care workers in hospitals--a review of studies on attitudes and predictors. Vaccine 2009 Jun 19;27(30):3935-44.

55. Prematunge C, Corace K, McCarthy A, Nair RC, Pugsley R, Garber G. Factors influencing pandemic influenza vaccination of healthcare workers--a systematic review. Vaccine 2012 Jul 6;30(32):4733-43.

56. Giacomini MK, Cook DJ. Users' guides to the medical literature: XXIII. qualitative research in health care B. what are the results and how do they help me care for my patients? evidence-based medicine working group. JAMA 2000 Jul 26;284(4):478-82.

57. Mills E, Jadad AR, Ross C, Wilson K. Systematic review of qualitative studies exploring parental beliefs and attitudes toward childhood vaccination identifies common barriers to vaccination. J Clin Epidemiol 2005 Nov;58(11):1081-8.

58. Patton MQ. Enhancing the quality and credibility of qualitative analysis. Health Serv Res 1999 Dec;34(5 Pt 2):1189-208.

59. Neuendorf KA. The content analysis guidebook. 2nd ed. Thousand Oaks, California: SAGE Publications; 2002. .

10.0 Appendix

Appendix – Section A1

Pandemic H1N1 (pH1N1) and Seasonal Influenza Vaccination Among Healthcare Workers

Demographic Information

1. **Age:_____ Month and Year of Birth (mm/yy)**:_____

2. **Sex**: □ Male □ Female

3. **Ethnic background**:
   □ Caucasian (White) □ African Descent □ Aboriginal
   □ Asian Descent □ South Asian Descent □ Middle Eastern
   □ South American Decent □ Hispanic Descent □ Other_____

4. **Were you born in Canada?** □ Yes □ No

   - **If *no,* what year did you move to Canada? _____**
   - **What is your current immigration status?**

   □ Canadian Citizen □ US Citizen □ Landed Immigrant

   □ Visa (e.g., Student Visa, Work Visa) □ Refugee
   □ Other (*Please specify*): _____

5. **Spiritual/Religious Beliefs:** □ Protestant □ Catholic □ Jewish □ Muslim
   □ Buddhist □ Hindu □ No Formal Beliefs □ None
   □ Other_____

6. **What is your current relationship status?**
   □ Single □ Married □ Steady Partner □ Widowed
   □ Divorced/Separated

7. **Do you have any dependent children under 21 years old?** □ Yes □ No
   If Yes
   a) Are they currently living with you? □ Yes □ No

8. **What is your main occupation?**
   ☐ Registered Nurse (RN)
   ☐ Registered Practical Nurse (RPN)
   ☐ Physicians / Resident
   ☐ Occupational Therapist
   ☐ Physiotherapist
   ☐ Recreation Therapist
   ☐ Psychologist
   ☐ Housekeeping
   ☐ Administration
   ☐ Students / Trainees
   ☐ Kitchen / Food and Nutrition Services
   ☐ Security
   ☐ Facilities
   ☐ Logistical Services
   ☐ Information Services

☐ Other - Please describe _____

9. **Which department do you work for at The Ottawa Hospital? _____**

10. Which campus do you work at? *(Please check all that apply)*

- ☐ Civic Campus
- ☐ The Ottawa Heart Institute
- ☐ General Campus
- ☐ Riverside Campus
- ☐ Rehabilitation Centre
- ☐ Ottawa Hospital Research Institute (OHRI)
- ☐ Other - Please describe _____

11. Is your work…

☐ Full-time ☐ Part-time ☐ Casual ☐ Other _____

12. Please indicate your responses to the following statements by marking an "X":

	Yes	No
I have children living in my home		
I come into contact with children on a regular basis		
I live with someone who is elderly		
I come into contact with elderly people on a regular basis		
I live with someone with a chronic health condition		
Someone in my immediate family has a chronic health condition		

Health Status

1. **Do you have a chronic health condition**? ☐ Yes ☐ No

2. In general, how would you say your health is? (check one)

☐ Poor ☐ Fair ☐ Good ☐ Very good ☐ Excellent

3. Have you had influenza in the past? ☐ Yes ☐ No

If Yes

When? _____(indicate year(s))

4. If you are a woman, are you pregnant? ☐ Yes ☐ No

If Yes

a) how many weeks pregnant are you ? _____ weeks

5. If you are a woman, were you pregnant in October, November or December 2009?

☐ Yes ☐ No

Vaccine History

1. Did you receive the SEASONAL INFLUENZA vaccine in 2008/2009 (October 2008-April 2009)?

☐ Yes ☐ No ☐ Do not know

1a) If yes, where did you receive the vaccine:

☐ Ottawa Hospital
☐ Family physician
☐ Public health clinic
☐ Other _____

2. Did you receive the SEASONAL INFLUENZA vaccine in 2009/2010 (October 2009-April 2010)?

☐ Yes ☐ No ☐ Do not know

2a) If yes, where did you receive the vaccine:

☐ Ottawa Hospital
☐ Family physician
☐ Public health clinic
☐ Other _____

3. Did you receive the pH1N1 vaccine in 2009?

☐ Yes ☐ No ☐ Do not know

3a) If yes, where did you receive the vaccine:

☐ The Ottawa Hospital
☐ Family physician
☐ Public health clinic
☐ Other _____

4. Do you have a chronic illness for which annual influenza vaccination is recommended by your doctor?

☐ No
☐ Yes, but I do not get vaccinated
☐ Yes, and I do get vaccinated

5. Have you ever experienced side-effects from the influenza vaccine?

☐ No
☐ Yes
☐ Not applicable as I was never vaccinated against influenza

6. If you ever experienced side-effects from the influenza vaccine, have these been uncomfortable enough to be a reason not to get vaccinated in the future?

☐ No
☐ Yes
☐ Not applicable as I was never vaccinated against influenza
☐ Not applicable as I never experienced side-effects of the influenza vaccine

7. Do you have an allergy to eggs?

☐ No
☐ Yes
☐ Don't know

8. Do you have an allergy to components of the influenza vaccine?

☐ No
☐ Yes
☐ Not applicable as I was ever vaccinated against influenza

pH1N1 Vaccine Attitudes and Knowledge

(Circle a number from 1 to 5 for each item).

		Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1)	I am at high personal risk for getting pH1N1	1	2	3	4	5
2)	It is very likely that I can infect patients with pH1N1 if I don't get the pH1N1 vaccine	1	2	3	4	5
3)	I am likely to get pH1N1 if I do not get the pH1N1 vaccine	1	2	3	4	5
4)	The pH1N1 vaccine is not required for a healthy person	1	2	3	4	5
5)	Health care workers are at greater risk than the general public of catching pH1N1	1	2	3	4	5
6)	I am at risk of catching pH1N1 from Hospital patients	1	2	3	4	5
7)	pH1N1 is dangerous for me	1	2	3	4	5
8)	pH1N1 is dangerous for the patients in the hospital at which I work.	1	2	3	4	5
9)	pH1N1 can be a bad disease	1	2	3	4	5
10)	If I were to get pH1N1 it would significantly interfere with my regular daily activities	1	2	3	4	5
11)	Other health problems that I have may become worse if I get pH1N1	1	2	3	4	5
12)	The thought of getting pH1N1 scares me	1	2	3	4	5
13)	If I get vaccinated against pH1N1, then I will be more certain that I will not infect patients.	1	2	3	4	5
14)	If I get vaccinated against pH1N1, then I will be more certain that I will not infect family members.	1	2	3	4	5
15)	Getting the pH1N1 vaccine will prevent me from getting pH1N1	1	2	3	4	5
16)	Getting the pH1N1 vaccine will prevent the spread of pH1N1	1	2	3	4	5
17)	The pH1N1 vaccine can cause pH1N1	1	2	3	4	5
18)	I do not expect any side effects (e.g. local tenderness or infection) from the pH1N1 vaccine	1	2	3	4	5

		Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
19)	I do not expect an allergic reaction or autoimmune disease after getting the pH1N1 vaccine	1	2	3	4	5
20)	I believe the pH1N1 vaccine is safe	1	2	3	4	5
21)	I do not have time to get the pH1N1 vaccine	1	2	3	4	5
22)	pH1N1 vaccines are painful	1	2	3	4	5
23)	Getting the pH1N1 vaccine interferes with my daily activities	1	2	3	4	5
24)	I am worried about the side effects of getting the pH1N1 vaccine	1	2	3	4	5
25)	I am fearful of needles	1	2	3	4	5
26)	I do not like getting injections	1	2	3	4	5
27)	The pH1N1 vaccine will make me sick	1	2	3	4	5
28)	People close to me (e.g. spouse, family, friends) think that it is important for me to get vaccinated against pH1N1	1	2	3	4	5
29)	My colleagues think that it is important for me to get vaccinated against pH1N1	1	2	3	4	5
30)	My doctor encouraged me to get the pH1N1 vaccine	1	2	3	4	5
31)	My supervisor thought it was a good idea for me to get the pH1N1 vaccine	1	2	3	4	5
32)	All health care workers should be vaccinated against pH1N1	1	2	3	4	5
33)	It is important that health care workers have freedom of choice concerning getting the pH1N1 vaccine	1	2	3	4	5
34)	I do not believe in immunizations	1	2	3	4	5

Seasonal Influenza Vaccine Attitudes and Knowledge

(Circle a number from 1 to 5 for each item).

		Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1)	I am at high personal risk for getting seasonal influenza	1	2	3	4	5
2)	It is very likely that I can infect patients with seasonal influenza if I don't get the seasonal influenza vaccine	1	2	3	4	5
3)	I am likely to get seasonal influenza if I do not get the seasonal influenza vaccine	1	2	3	4	5
4)	The seasonal influenza vaccine is not required for a healthy person	1	2	3	4	5
5)	Health care workers are at greater risk than the general public of catching seasonal influenza	1	2	3	4	5
6)	I am at risk of catching seasonal influenza from my patients	1	2	3	4	5
7)	Seasonal influenza is dangerous for me	1	2	3	4	5
8)	Seasonal influenza is dangerous for the patients in the hospital at which I work.	1	2	3	4	5
9)	Seasonal influenza can be a bad disease	1	2	3	4	5
10)	If I were to catch seasonal influenza it would significantly interfere with my regular daily activities	1	2	3	4	5
11)	Other health problems that I have may become worse if I catch seasonal influenza	1	2	3	4	5
12)	The thought of getting seasonal influenza scares me	1	2	3	4	5
13)	If I get vaccinated against seasonal influenza, then I will be more certain that I will not infect patients.	1	2	3	4	5
14)	If I get vaccinated against seasonal influenza, then I will be more certain that I will not infect family members.	1	2	3	4	5
15)	Getting the seasonal influenza shot will prevent me from getting seasonal influenza	1	2	3	4	5

		Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
16)	Getting the seasonal influenza vaccine will prevent the spread of seasonal influenza	1	2	3	4	5
17)	The seasonal influenza vaccine can cause influenza	1	2	3	4	5
18)	I do not expect any side effects (e.g. local tenderness or infection) from the seasonal influenza vaccine	1	2	3	4	5
19)	I do not expect an allergic reaction or autoimmune disease after getting the seasonal influenza vaccine	1	2	3	4	5
20)	I believe the seasonal influenza vaccine is safe	1	2	3	4	5
21)	I do not have time to get the seasonal influenza vaccine	1	2	3	4	5
22)	Seasonal influenza vaccines are painful	1	2	3	4	5
23)	Getting the seasonal influenza vaccine interferes with my daily activities	1	2	3	4	5
24)	I am worried about the side effects of getting the seasonal influenza vaccine	1	2	3	4	5
25)	I am fearful of needles	1	2	3	4	5
26)	I do not like getting injections	1	2	3	4	5
27)	The seasonal influenza vaccine will make me sick	1	2	3	4	5
28)	People close to me (e.g. spouse, family, friends) think that it is important for me to get vaccinated against seasonal influenza	1	2	3	4	5
29)	My colleagues think that it is important for me to get vaccinated against seasonal influenza	1	2	3	4	5
30)	My doctor encouraged me to get the seasonal influenza vaccine	1	2	3	4	5
31)	My supervisor thought it was a good idea for me to get the seasonal influenza vaccine	1	2	3	4	5
32)	All health care workers should be vaccinated against seasonal influenza	1	2	3	4	5

		Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
33)	It is important that health care workers have freedom of choice concerning getting the seasonal influenza vaccine	1	2	3	4	5
34)	I do not believe in immunizations	1	2	3	4	5

Reasons for Vaccine Uptake

1. Please list, in order of priority, your top 3 reasons for getting the pH1N1 vaccine, or check the box to indicate that you DID NOT get this vaccine.

☐ I **did not** get the pH1N1 vaccine

#1 _____ (Most Important Reason)

#2 _____

#3 _____

2. Please list, in order of priority, your top 3 reasons for getting the SEASONAL INFLUENZA vaccine in 2008/09 (October 2008-April 2009), or check the box to indicate that you DID NOT get this vaccine.

☐ I **did not** get the 2008/09 seasonal influenza vaccine

#1 _____ (Most Important Reason)

#2 _____

#3 _____

3. Please list, in order of priority, your top 3 reasons for getting the SEASONAL INFLUENZA vaccine in 2009/2010 (October 2009-April 2010), or check the box to indicate that you DID NOT get this vaccine.

☐ **I did not** get the 2009/2010 seasonal influenza vaccine

#1 _____ (Most Important Reason)

#2 _____

#3 _____

4. Please respond to the following item only if you received the pH1N1 vaccine in 2009, but did NOT receive the seasonal influenza vaccine in 2008/09 (October 2008-April 2009).

a) Why did you receive the pH1N1 vaccine in 2009 when you did not receive the seasonal influenza vaccine in 2008/09 (October 2008-April 2009)?

#1 _____ (Most Important Reason)

#2 _____

#3 _____

5. Please respond to the following item only if you DID NOT receive the pH1N1 vaccine in 2009, but DID receive the seasonal influenza vaccine in 2008/09 (October 2008-April 2009).

a) Why did you refuse the pH1N1 vaccine in 2009 when you got the seasonal influenza vaccine in 2008/09 (October 2008-April 2009)?

#1 _____ (Most Important Reason)

#2 _____

#3 _____

Reasons for Vaccine Refusal

1. Please list, in order of priority, your top 3 reasons why you DID NOT get the pH1N1 vaccine, or check the box to indicate that you DID get this vaccine.

☐ I got the pH1N1 vaccine

#1 _____ (Most Important Reason)

#2 _____

#3 _____

2. Please list, in order of priority, your top 3 reasons why you DID NOT get the SEASONAL INFLUENZA vaccine in 2008/09 (October 2008-April 2009), or check the box to indicate that you DID get this vaccine.

☐ I got the 2008/09 seasonal influenza vaccine

#1 _____ (Most Important Reason)

#2 _____

#3 _____

3. Please list, in order of priority, your top 3 reasons why you DID NOT get the SEASONAL INFLUENZA vaccine in 2009/2010 (October 2009-April 2010), or check the box to indicate that you DID get this vaccine.

☐ I got the 2009/2010 seasonal influenza vaccine

#1 _____ (Most Important Reason)

#2 _____

#3 _____

pH1N1 Client Satisfaction Questionnaire

Please help us improve our services by answering some questions about the services you have received **during the pH1N1 Vaccine Campaign at The Ottawa Hospital (TOH)**. We are interested in your honest opinion, whether your comments are positive or negative. Please answer all of the questions by marking an "X" in the box with your answer.

1. How would you rate the quality of the pH1N1 vaccine services that were available to you at TOH?

❑	❑	❑	❑
Poor	**Fair**	**Good**	**Excellent**

2. The pH1N1 vaccine services that were available to you at TOH met:

❑	❑	❑	❑
All of my needs	Most of my needs	Some of my needs	None of my needs

3. Did the services you received at TOH pH1N1 vaccine clinic help you to cope better with getting the pH1N1 flu shot?

❑	❑	❑	❑
Yes, they helped a great deal	Yes, they helped somewhat	No, they didn't really help	No, they seemed to make things worse

4. In general, how satisfied are you with the organization of the health services you received at TOH pH1N1 vaccine clinic ?

❑	❑	❑	❑
Very dissatisfied	Dissatisfied	Satisfied	Very satisfied

5. At the TOH pH1N1 vaccine clinic, did you feel actively involved in making informed decisions about getting your pH1N1 flu shot?

❑	❑	❑	❑
Yes, very much	Yes, quite a bit	Somewhat	Not at all

6. How satisfied were you with the convenience (e.g. location, alphabetical time slots for being vaccinated) of the TOH pH1N1 vaccine clinic?

❑	❑	❑	❑
Very dissatisfied	Dissatisfied	Satisfied	Very satisfied

7. Please list the top 3 things you were MOST SATISFIED with about the TOH pH1N1 vaccine campaign.

#1 _____

#2 _____

#3 _____

8. Please list the top 3 things you were LEAST SATISFIED with about the TOH pH1N1 vaccination campaign.

#1 _____

#2 _____

#3 _____

9. How would you recommend we improve the TOH influenza vaccine services in the future?

Ottawa Hospital Research Ethics Boards / Conseils d'éthique en recherches

751 Parkdale Avenue Suite 106, Ottawa, Ontario K1Y 1J7 613-798-5555 ext. 14902 Fax: 613-761-4311
http://www.ohri.ca/ohreb

Friday, April 09, 2010

Dr. Gary Garber
Ottawa Hospital - General Campus
Division of Infectious Diseases

[redacted]

Dear Dr. Garber:

Re: Protocol # 2010156-01H Optimizing H1N1 Vaccination Uptake Among Health Care Workers

Protocol approval valid until - Wednesday, June 09, 2010

Thank you for the letter from Ms. I. Seguin dated March 31, 2010. I am pleased to inform you that this protocol underwent expedited review by the Ottawa Hospital Research Ethics Board (OHREB) and is approved. No changes, amendments or addenda may be made to the protocol or the consent form without the OHREB's review and approval.

Approval is for the following documentation:
- Proposal received February 23, 2010
- English Information Letter dated March 30, 2010
- English Questionnaires all received February 23, 2010

Upon receipt and review of the French consent form and questionnaires, the protocol may be extended to April 8, 2011 (one year from the initial approval date), and the recruitment of French-speaking participants may commence. When submitting the French documentation to the OHREB, confirm that it has been translated or approved by Eric Lepine (email all documentation, except validated questionnaires, to Eric at elepine@ohri.ca).

The validation date should be indicated on the bottom of all consent forms and information sheets (see copy attached).

The Ottawa Hospital Research Ethics Board is constituted in accordance with, and operates in compliance with the requirements of the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans; Health Canada Good Clinical Practice: Consolidated Guideline; Part C Division 5 of the Food and Drug Regulations of Health Canada; and the provisions of the Ontario Health Information Protection Act 2004 and its applicable Regulations.

[redacted]

Raphael Saginur, M.D.
Chairman

Search Terms

	Concept 1	**Concept 2**	**Concept 3**	**Concept 4**
OR	Healthcare Worker	H1N1	Knowledge	Vaccine
OR	Healthcare Facility Staff	pH1N1	Attitudes	Vaccination
OR	Allied Healthcare Worker	Pandemic influenza	Barriers	Immunity
OR	Healthcare Professional	Swine flu	Reasons	Immunization
OR	Nurses		Health Beliefs	Flu shot
OR	Physicians		Motivators	
OR	Medical Students			

Appendix – Section B2

Sample Search Strategy (Medline)

1. allied health personnel/ or exp health facility administrators/ or exp medical staff/ or exp nurses/ or exp nursing staff/ or exp personnel, hospital/ or pharmacists/ or physician executives/ or exp physicians/
2. exp Health Personnel/
3. Infectious Disease Transmission, Patient-to-Professional/ or Infectious Disease Transmission, Professional-to-Patient/
4. (healthcare adj2 worker$).ab,ti.
5. health care worker$.ab,ti.
6. health care personnel.ab,ti.
7. healthcare personnel.ab,ti.
8. health care professional$.ab,ti.
9. healthcare professional$.ab,ti.
10. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9
11. Influenza A Virus, H1N1 Subtype/
12. H1N1.ab,ti.
13. pH1N1.ab,ti.
14. 11 or 12 or 13
15. exp Vaccination/
16. Mass Vaccination/
17. vaccin$.ab,ti.
18. immuni$.ab,ti.
19. flu vaccine.ab,ti.
20. flu shot$.ab,ti.
21. 15 or 16 or 17 or 18 or 19 or 20
22. Health Knowledge, Attitudes, Practice/
23. health behavior/ or treatment refusal/
24. attitud$.ab,ti.
25. perception$.ab,ti.
26. expectat$.ab,ti.
27. opinion$.ab,ti.
28. belief$.ab,ti.
29. knowledge.ab,ti.
30. reason$.ab,ti.
31. deci$.ab,ti.
32. barrier$.ab,ti.
33. 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32
34. 10 and 14 and 21 and 33
35. limit 34 to (english language and yr="2005 -Current")
36. 34 not 35

Appendix – Section B3

Sample Data Extraction From

Study ID ☐☐☐☐

Authors _____

COHORT STUDY ☐
CASE-CONTROL STUDY ☐
CROSS-SECTIONAL STUDY ☐
OTHER STUDY TYPE ☐
(SPECIFY) _____

Study Setting

Exact Description of the study location

DETAILS/INFORMATION NEEDED FROM AUTHORS

Time- frame of Assessment (data collection)

DETAILS/INFORMATION NEEDED FROM AUTHORS

Study Population

Exact Description of the study population

DETAILS/INFORMATION NEEDED FROM AUTHORS

Vaccination rate (proportion) in the sample population
Vaccination rate (proportion) in the study sample

INFORMATION NEEDED FROM AUTHORS: Vaccination rate (proportion) in the sample population not provided

INFORMATION NEEDED FROM AUTHORS: Vaccination rate (proportion) in the study sample not provided

Seasonal influenza Vaccination Rate

Vaccination rate (proportion) in the sample population

Vaccination rate (proportion) in the study sample

INFORMATION NEEDED FROM AUTHORS: Vaccination rate (proportion) in the sample population not provided

INFORMATION NEEDED FROM AUTHORS: Vaccination rate (proportion) in the study sample not provided

Predictors of immunization Status

Predictors of Immunization measures Assessed/examined (type of data collected)

Choice of Predictors assessed/examined based on valid and reliable theory/methodology (e.g HBM)

- Yes

- No, INFORMATION NEEDED FROM AUTHORS

- the Theory/method used

Type of Analysis used to predict vaccination outcomes

INFORMATION NEEDED FROM AUTHORS:

Study findings

General Overall statements

Study Examined Knowledge and Awareness Regarding Influenza Vaccination

- Yes

- No, INFORMATION NEEDED FROM AUTHORS

(% of agreement)

INFORMATION NEEDED FROM AUTHORS:

Constructs of the HBM Examined in the Study

Predictors of Immunization measures Assessed/examined in the Study based on the HBM constructs

- Perceived Barriers (% of agreement)

- Perceived Motivators (% of agreement)

- Perceived Severity to H1N1 (% of agreement)

- Perceived Susceptibility to H1N1 (% of agreement)

- Cues to Action (% of agreement)

Appendix – Section B4

Full List of Articles Screened- Dec 2011

1. Abbott, D., & Morton, K. (2010). H1N1 vaccine in pregnancy: The response so far. *Archives of Disease in Childhood: Fetal and Neonatal Edition.Conference: 14th Annual Conference of the British Maternal and Fetal Medicine Society Gateshead United Kingdom.Conference Start: 20100610 Conference End: 20100611.Conference Publicatio(TRUNCATED), 95*, Fa46-Fa47.
2. Abstracts and posters from the 2010 canadian pharmacists association conference.(2010). *Canadian Pharmacists Journal, Conference: 2010 Canadian Pharmacists Association Conference Calgary, AB Canada. Conference Start: 20100515 Conference End: 20100518. Conference Publication*(var.pagings), ate of Pubaton: Setember 2010.
3. Aggarwal, N., & Aggarwal, P. (2009). Passive immunity to pandemic H1N1 2009 by swine flu parties. *Journal of Infection in Developing Countries, 3*(10), 739-743.
4. Ahluwalia, I. B., Singleton, J. A., Jamieson, D. J., Rasmussen, S. A., & Harrison, L. (2011). Seasonal influenza vaccine coverage among pregnant women: Pregnancy risk assessment monitoring system. *Journal of Women's Health, 20*(5), 649-651.
5. Ahmadipour, N., Houle, S., Kim, S., Lafleche, J., Pless, R., & Law, B. (2010). Persistent pain in the vaccinated limb following the 2009-10 pandemic H1N1 mass immunization campaign in canada. *Canadian Journal of Infectious Diseases and Medical Microbiology.Conference: 9th Canadian Immunization Conference Quebec City, QC Canada.Conference Start: 20101205 Conference End: 20101208.Conference Publication: (Var.Pagings), 21*(4), 223.
6. Ahmed, G. Y., Balkhy, H. H., Bafaqeer, S., Al-Jasir, B., & Althaqafi, A. (2011). Acceptance and adverse effects of H1N1 vaccinations among a cohort of national guard

health care workers during the 2009 hajj season. *BMC Research Notes, 4*, 61. Retrieved from http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=prem&AN=21396123; http://sfx.scholarsportal.info/ottawa?sid=OVID:medline&id=pmid:21396123&id=doi:&issn=1756-0500&isbn=&volume=4&issue=&spage=61&pages=61&date=2011&title=BMC+Research+Notes&atitle=Acceptance+and+Adverse+Effects+of+H1N1+Vaccinations+Among+a+Cohort+of+National+Guard+Health+Care+Workers+during+the+2009+Hajj+Season.&aulast=Ahmed&pid=%3Cauthor%3EAhmed+GY%3BBalkhy+HH%3BBafaqeer+S%3BAl-Jasir+B%3BAlthaqafi+A%3C%2Fauthor%3E%3CAN%3E21396123%3C%2FAN%3E%3CDT%3EJournal+Article%3C%2FDT%3E

7. Akis, S., Velipasaoglu, S., Camurdan, A. D., Beyazova, U., & Sahin, F. (2011). Factors associated with parental acceptance and refusal of pandemic influenza A/H1N1 vaccine in turkey. *European Journal of Pediatrics, 170*(9), 1165-1172.
8. Alkuwari, M. G., Aziz, N. A., Nazzal, Z. A. S., & Al-Nuaimi, S. A. (2011). Pandemic influenza A/H1N1 vaccination uptake among health care workers in qatar: Motivators and barriers. *Vaccine, 29*(11), 2206-2211.
9. Althouse, B. M., Bergstrom, T. C., & Bergstrom, C. T. (2010). A public choice framework for controlling transmissible and evolving diseases. *Proceedings of the National Academy of Sciences of the United States of America, 107*(SUPPL. 1), 1696-1701.
10. Amodio, E., Tramuto, F., Maringhini, G., Asciutto, R., Firenze, A., Vitale, F., et al. (2011). Are medical residents a "core group" for future improvement of influenza vaccination coverage in health-care workers? A study among medical residents at the university hospital of palermo (sicily). *Vaccine, 29*(45), 8113-8117.

11. Ang, B., Archuleta, S., Chiew, Y. F., Chlebicki, M. P., Chua, A., Fisher, D. A., et al. (2009). Management of novel influenza epidemics in singapore: Consensus recommendations from the hospital influenza workgroup (singapore). *Singapore Medical Journal, 50*(6), 567-580.
12. Apidechkul, T. (2010). An outbreak of influenza A (H1N1) 2009 at mae fah luang university, chiang rai province, northern thailand. *Retrovirology.Conference: 16th International Symposium on HIV and Emerging Infectious Diseases Marseille France.Conference Start: 20100324 Conference End: 20100326.Conference Publication: (Var.Pagings), 7,* P187.
13. Apinaniz, A., Lopez-Picado, A., Miranda-Serrano, E., Latorre, A., Cobos, R., Parraza-Diez, N., et al. (2010). Population-based cross sectional study about vaccine acceptability and perception of the severity of A/H1N1 influenza: Opinion of the general population and health professionals. [Estudio transversal basado en la poblacion sobre la aceptabilidad de la vacuna y la percepcion de la gravedad de la gripe A/H1N1: opinion de la poblacion general y de los profesionales sanitarios] *Gaceta Sanitaria / S.E.S.P.A.S, 24*(4), 314-320.
14. Arda, B., Durusoy, R., Yamazhan, T., Sipahi, O. R., Tasbakan, M., Pullukcu, H., et al. (2011). Did the pandemic have an impact on influenza vaccination attitude? A survey among health care workers. *BMC Infectious Diseases, 11,* 87.
15. Ashelby, L. C., & Trinder, J. (2011). Swine flu vaccination: Why won't women have it?. *Archives of Disease in Childhood: Fetal and Neonatal Edition.Conference: Perinatal Medicine 2011 Harrogate United Kingdom.Conference Start: 20110615 Conference End: 20110617.Conference Publication: (Var.Pagings), 96,* Fa102.
16. Athanasakis, K., Zavras, D., & Kyriopoulos, J. (2010). Factors influencing the decision to be vaccinated against H1N1 in greece. *Value in Health.Conference: ISPOR 13th Annual*

European Congress Prague Czech Republic.Conference Start: 20101106 Conference End: 20101109.Conference Publication: (Var.Pagings), 13(7), A443.

17. Aytac, S., Gokce, M., Unal, S., Ertekin, O., Kara, A., Ceyhan, M., et al. (2010). H1N1 associated hemophagocytic syndrome should be taken into account. *Haematologica.Conference: 15th Congress of the European Hematology Association, EHA 2010 Barcelona Spain.Conference Start: 20100610 Conference End: 20100613.Conference Publication: (Var.Pagings), 95*, 733.
18. Baca-Muro, V. I., Soria-Cedillo, I. F., Olvera, K., & Garcia-Contreras, F. (2009). Prevention of an influenza pandemic in mexico: Establishing a cost-effective alternative for elderly population. *Value in Health.Conference: ISPOR 12th Annual European Congress Paris France.Conference Start: 20091024 Conference End: 20091027.Conference Publication: (Var.Pagings), 12*(7), A425.
19. Balasegaram, S., Glasswell, A., Cleary, V., Turbitt, D., & McCloskey, B. (2011). From containment to community: Trigger points from the london pandemic (H1N1) 2009 influenza incident response. *Public Health, 125*(2), 72-78.
20. Begue, P. (2010). Consequences of opposition to vaccination in france and europe. how to maintain effective vaccine coverage in 2010?. [Consequences des oppositions vaccinales en France et en Europe. Comment maintenir une couverture vaccinale efficace en 2010?.] *Bulletin De l'Academie Nationale De Medecine, 194*(4-5) (pp 719-732), ate of Pubaton: ArMay 2010.
21. Bennett, A., & Abdi, A. (2010). 2009 pH1N1 influenza mass immunization clinics: Effectiveness in an isolated first nation community. *Canadian Journal of Infectious Diseases and Medical Microbiology.Conference: 9th Canadian Immunization Conference Quebec City, QC Canada.Conference Start: 20101205 Conference End: 20101208.Conference Publication: (Var.Pagings), 21*(4), 229.

22. Bettinger, J. A., Dawar, M., Hasselback, P., & Naus, M. (2010). Parental knowledge, attitudes and beliefs around pandemic H1N1 immunization in british columbia. *Canadian Journal of Infectious Diseases and Medical Microbiology.Conference: 9th Canadian Immunization Conference Quebec City, QC Canada.Conference Start: 20101205 Conference End: 20101208.Conference Publication: (Var.Pagings), 21*(4), 217.
23. Blasi, F., Palange, P., Rohde, G., Severin, T., Cornaglia, G., & Finch, R. (2011). Healthcare workers and influenza vaccination: An ERS-ESCMID web-based survey. *Clinical Microbiology & Infection, 17*(8), 1223-1225. doi:http://dx.doi.org/10.1111/j.1469-0691.2011.03501.x
24. Block, S. L. (2009). The daunting practicalities of in-office pediatric influenza vaccination: 2009-2010. *Pediatric Annals, 38*(12), 655-660.
25. Boccia, A., Di Thiene, D., De Giusti, M., & La Tore, G. (2011). Seasonal and pandemic influenza: The role of communication and preventive strategies. *Journal of Preventive Medicine and Hygiene, 52*(3), 124-126.
26. Boyeau, C., Tanguy, M., Pean, S., Delhumeau, A., & Fanello, S. (2011). Seasonal and pandemic A (H1N1) 2009 influenza vaccination coverage among health-care workers in a french university hospital. [Couverture vaccinale antigrippale saisonniere et pandemique (H1N1) 2009: etude aupres du personnel du chu d'Angers] *Sante Publique (Vandoeuvre-Les-Nancy, France), 23*(1), 19-29.
27. Brandt, C., F Rabenau, H. F., Bornmann, S., Gottschalk, R., & Wicker, S. (2011). The impact of the 2009 influenza A(H1N1) pandemic on attitudes of healthcare workers toward seasonal influenza vaccination 2010/11.
28. Brandt, C., Rabenau, H., F., & Wicker, S. (2011). Attitudes of influenza-vaccinated health care workers toward masks to prevent nosocomial transmission of influenza. *Journal of the Association of Occupational Health Professionals in Healthcare, 31*(3), 24-29.

29. Bresee, J. (2010). Seasonal influenza surveillance - what are the benefits?. *Influenza and Other Respiratory Viruses.Conference: International Symposium on Viral Respiratory Disease Surveillance of the International Society for Influenza and Other Respiratory Virus, ISIRV Seville Spain.Conference Start: 20090325 Conferen(TRUNCATED), 4*, 3-4.
30. Briand, S. (2010). Future developments in global influenza surveillance. *Influenza and Other Respiratory Viruses.Conference: International Symposium on Viral Respiratory Disease Surveillance of the International Society for Influenza and Other Respiratory Virus, ISIRV Seville Spain.Conference Start: 20090325 Conferen(TRUNCATED), 4*, 8.
31. Broos, N., van Puijenbroek, E. P., & van Grootheest, K. (2010). Fever following immunization with influenza A (H1N1) vaccine in children: A survey-based study in the netherlands. *Drug Safety, 33*(12), 1109-1115.
32. Broughton, D. E., Beigi, R. H., Switzer, G. E., Raker, C. A., & Anderson, B. L. (2009). Obstetric health care workers' attitudes and beliefs regarding influenza vaccination in pregnancy. *Obstetrics and Gynecology, 114*(5), 981-987.
33. Brown, J. R., Goebel, L. J., Neitch, S. M., Tweel, H. K., & Mufson, M. A. (2011). Barriers to vaccinating the elderly with H1N1 vaccine. *The American Journal of the Medical Sciences, 342*(1), 24-26.
34. Burke, R. L., Vest, K. G., Eick, A. A., Sanchez, J. L., Johns, M. C., Pavlin, J. A., et al. (2011). Department of defense influenza and other respiratory disease surveillance during the 2009 pandemic. *BMC Public Health, 11 Suppl 2*, S6.
35. Cadeddu, C., Di Thiene, D., Ricciardi, W., Bocia, A., & La Tore, G. (2011). Knowledge about pandemic flu among italian health care workers (HCWs): An italian survey. *Journal of Preventive Medicine and Hygiene, 52*(3), 127-130.
36. Casari, S., Facchi, C., Paraninfo, G., Casella, M., Quattrocchi, R., Castelli, F., et al. (2010). H1N1 vaccination in HIV patients. *Infection.Conference: Italian Conference on*

AIDS and Retroviruses, ICAR 2010 Brescia Italy.Conference Start: 20100620 Conference End: 20100622.Conference Publication: (Var.Pagings), 38, 67.

37. Chambers, L. W., McCarthy, A. E., McNeil, S., Puxty, J., Wilson, K., Crowe, L., et al. (2010). Randomized trial of the impact of the ottawa influenza decision aid on healthcare personnel confidence to be immunized. *Canadian Journal of Infectious Diseases and Medical Microbiology.Conference: 9th Canadian Immunization Conference Quebec City, QC Canada.Conference Start: 20101205 Conference End: 20101208.Conference Publication: (Var.Pagings), 21*(4), 212.
38. Chao, D. Y., Cheng, K. F., Li, T. C., Wu, T. N., Chen, C. Y., Tsai, C. A., et al. (2011). Serological evidence of subclinical transmission of the 2009 pandemic H1N1 influenza virus outside of mexico. *PloS One, 6*(1), e14555.
39. Cherkaoui, S., Mereniuk, A., Psyharis, C., Thai, K., & Guay, M. (2010). Influenza vaccination and daycare workers: Compatible or not?. *Canadian Journal of Infectious Diseases and Medical Microbiology.Conference: 9th Canadian Immunization Conference Quebec City, QC Canada.Conference Start: 20101205 Conference End: 20101208.Conference Publication: (Var.Pagings), 21*(4), 215.
40. Chin-Yee, B. H., Monkman, K., Hussain, Z., & Minuk, L. A. (2011). Attitudes toward vaccination for pandemic H1N1 and seasonal influenza in patients with hematologic malignancies. *The Journal of Supportive Oncology, 9*(4), 156-160.
41. Chor, J. S., Ngai, K. L., Goggins, W. B., Wong, M. C., Wong, S. Y., Lee, N., et al. (2009). Willingness of hong kong healthcare workers to accept pre-pandemic influenza vaccination at different WHO alert levels: Two questionnaire surveys. *BMJ (Clinical Research Ed.), 339*, b3391.

42. Chor, J. S. Y., Pada, S. K., Stephenson, I., Goggins, W. B., Tambyah, P. A., Clarke, T. W., et al. (2011). Seasonal influenza vaccination predicts pandemic H1N1 vaccination uptake among healthcare workers in three countries. *Vaccine, 29*(43), 7364-7369.

43. Cinel, G., Kiper, N., Yalcyn, E., Ersoz, D. D., Ozcelik, U., Haliloglu, M., et al. (2010). Pneumothorax complicating pneumonia in a child associated with pandemic influenza A (H1N1) virus infection. *Paediatric Respiratory Reviews.Conference: 9th International Congress on Pediatric Pulmonology Vienna Austria.Conference Start: 20100619 Conference End: 20100621.Conference Publication: (Var.Pagings), 11*, S87-S88.

44. Clews, G. (2009). Nurses reluctant have swine flu jabs. *Nursing Times, 105*(32-33) (pp 1), ate of Pubaton: 2009 Aug 18-31.

45. Coe, A., Gatewood, S., Moczygemba, L., Goode, J., & Beckner, J. (2010). Use of the health belief model to assess patient predictors of intent to receive the 2009 H1N1 influenza vaccine. *Journal of the American Pharmacists Association.Conference: APhA2010 Washington, DC United States.Conference Start: 20100312 Conference End: 20100315.Conference Publication: (Var.Pagings), 50*(2), 243.

46. Collignon, P. (2009). Pandemic influenza: Inappropriate fear causes inappropriate responses. in healthcare we need good surveillance data to make the best decisions. *Healthcare Infection, 14*(3), 77-79.

47. Corace, K., Prematunga, C., Mccarthy, A., Roth, V., Hayes, T., Suh, K. N., et al. (2011). Why did health care workers refuse the pH1N1 vaccine during the pandemic?. *Canadian Journal of Infectious Diseases and Medical Microbiology.Conference: AMMI Canada-CACMID 2011 Annual Conference Abstracts Montreal, QC Canada.Conference Start: 20110407 Conference End: 20110409.Conference Publication: (Var.Pagings), 22*, 13A.

48. Corace, K., M., Prematunga, C., B., McCarthy, A., E., Roth, V., R., Hayes, T., Suh, K., N., et al. (2011). Motivators and barriers to pH1N1 vaccine uptake among healthcare workers. *American Journal of Infection Control, 39*(5), E75-E75.

49. Cumber, S. L., Heffer, S. J., Gandhi, S., & Avery, A. J. (2010). The yellow card scheme: Experience of patient reporting of adverse drug reactions 5 years since launch. *Pharmacoepidemiology and Drug Safety.Conference: 26th International Conference on Pharmacoepidemiology and Therapeutic Risk Management Brighton United Kingdom.Conference Start: 20100819 Conference End: 20100822.Conference Publication: (Var.Pagings), 19*, S321.

50. Curtis, M. P., Hendrickson, S., & Georgantopoulos, P. (2010). Community collaboration in a community H1N1 vaccination program. *Journal of Community Health Nursing, 27*(3), 121-125.

51. Daugherty, E. L., Branson, R. D., Deveraux, A., & Rubinson, L. (2010). Infection control in mass respiratory failure: Preparing to respond to H1N1. *Critical Care Medicine, 38*(4), e103-9.

52. Debbag, R., Enrique, S., Garca, F., Sarkis, C., Vujacich, C., Andin, E., et al. (2010). 7 years' experience in a telemedicine program in infectious diseases in argentina. *International Journal of Infectious Diseases.Conference: 14th International Congress on Infectious Diseases (ICID) Miami, FL United States.Conference Start: 20100309 Conference End: 20100312 Sponsor: Pfizer, Sanofi-Pasteur, American Society for (TRUNCATED), 14*, e436.

53. Dehner, G. (2010). WHO knows best? national and international responses to pandemic threats and the "lessons" of 1976. *Journal of the History of Medicine and Allied Sciences, 65*(4), 478-513.

54. Dinleyici, E. C., & Kurugol, Z. (2010). 6th world congress of the world society for pediatric infectious diseases (WSPID). *Expert Review of Vaccines, 9*(3), 261-272.

55. Dube, E., Fannie, D., Vladimir, G., Julie, B. A., Chantal, S., France, L., et al. (2011). A(H1N1) pandemic influenza and its prevention by vaccination: Paediatricians' opinions before and after the beginning of the vaccination campaign. *BMC Public Health, 11*, 128.

56. Dube, E., Gilca, V., Sauvageau, C., Boulianne, N., Boucher, F. D., Bettinger, J. A., et al. (2010). Canadian family physicians' and paediatricians' opinions toward a(H1N1) pandemic vaccine before and after vaccination campaign onset. *Canadian Journal of Infectious Diseases and Medical Microbiology.Conference: 9th Canadian Immunization Conference Quebec City, QC Canada.Conference Start: 20101205 Conference End: 20101208.Conference Publication: (Var.Pagings), 21*(4), 220.

57. Duong, M., Mahy, S., Binois, R., Buisson, M., Piroth, L., & Chavanet, P. (2011). Vaccination coverage of healthcare professionals in an infectious diseases department. [Couverture vaccinale des professionnels de sante dans un service d'infectiologie.] *Medecine Et Maladies Infectieuses, 41*(3), 135-139.

58. Elizabeth Poalillo, F., Geiling, J., & Jimenez, E. J. (2010). Healthcare personnel and nosocomial transmission of pandemic 2009 influenza. *Critical Care Medicine, 38*(SUPPL. 4), e98-e102.

59. Eppes, C. S., Hornboegen, A., Garcia, P., & Grobman, W. (2011). Physician knowledge of H1N1 infl uenza and its association with patient vaccination rates. *Reproductive Sciences.Conference: 58th Annual Scientific Meeting of the Society for Gynecologic Investigation, SGI 2011 Miami Beach, FL United States.Conference Start: 20110316 Conference End: 20110319.Conference Publication: (Var.Pagings), 18*(3 SUPPL. 1), 234A.

60. Esteves-Jaramillo, A., Omer, S. B., Gonzalez-Diaz, E., Salmon, D. A., Hixson, B., Navarro, F., et al. (2009). Acceptance of a vaccine against novel influenza A (H1N1) virus among health care workers in two major cities in mexico. *Archives of Medical Research, 40*(8), 705-711.

61. Fabry, P., Gagneur, A., & Pasquier, J. -. (2011). Understanding pregnant womens intentions to have the A/H1N1 vaccine. *American Journal of Obstetrics and Gynecology.Conference: 2011 31st Annual Meeting of the Society for Maternal-Fetal Medicine: The Pregnancy Meeting San Francisco, CA United States.Conference Start: 20110207 Conference End: 20110212.Conference P(TRUNCATED), 204*(1 SUPPL), S247.

62. Ferguson, C. D., Ferguson, T. E., Golledge, J., & McBride, W. J. (2010). Pandemic influenza vaccination: Will the health care system take its own medicine? *The Australian Journal of Rural Health, 18*(4), 137-142.

63. Ferrante, G., Baldissera, S., Moghadam, P. F., Carrozzi, G., Trinito, M. O., & Salmaso, S. (2011). Surveillance of perceptions, knowledge, attitudes and behaviors of the italian adult population (18-69 years) during the 2009-2010 A/H1N1 influenza pandemic. *European Journal of Epidemiology*, *26*(3), 211-219.

64. Fields, C., Elswick, B., Jacknowitz, A., Anderson, D., Dickey, C., & Swisher, C. (2010). Impact of influenza pandemic on patients' actions and attitudes in receiving vaccinations in a rural community pharmacy setting. *Journal of the American Pharmacists Association.Conference: APhA2010 Washington, DC United States.Conference Start: 20100312 Conference End: 20100315.Conference Publication: (Var.Pagings), 50*(2), 233-234.

65. Fiore A.E. Fry A. Shay D. Gubareva L. Bresee J.S. Uyeki T.M. Centers for Disease Control and Prevention (CDC). (2011). Antiviral agents for the treatment and

chemoprophylaxis of influenza --- recommendations of the advisory committee on immunization practices (ACIP). *MMWR.Surveillance Summaries : Morbidity and Mortality Weekly Report.Surveillance Summaries / CDC, 60*(1), 1-24.

66. Fiore, A. E. (2010). Influenza vaccination: Where do we stand?. *International Journal of Infectious Diseases.Conference: 14th International Congress on Infectious Diseases (ICID) Miami, FL United States.Conference Start: 20100309 Conference End: 20100312 Sponsor: Pfizer, Sanofi-Pasteur, American Society for (TRUNCATED), 14*, e12.
67. Foisy, J., Heidebrecht, C. L., Pereira, J. A., Quach, S., Quan, S. D., Guay, M., et al. (2010). Clinic staff perceptions of data collection methodologies used during the 2009 H1N1 influenza campaign in canada. *Canadian Journal of Infectious Diseases and Medical Microbiology.Conference: 9th Canadian Immunization Conference Quebec City, QC Canada.Conference Start: 20101205 Conference End: 20101208.Conference Publication: (Var.Pagings), 21*(4), 221.
68. Galvez, B. B. (2010). Viral lung infections in the tropics. *Respirology.Conference: 15th Congress of the Asian Pacific Society of Respirology Manila Philippines.Conference Start: 20101122 Conference End: 20101125.Conference Publication: (Var.Pagings), 15*, 3.
69. Ganjoo, N., Aurora, R., & Muthukumar, P. (2010). In Nice Acropolis Convention Center N. (Ed.), *Acceptance of swine flu (H1N1) vaccine among health care workers: A U.K tertiary neonatal unit survey*
70. Gargano, L. M., Painter, J. E., Sales, J. M., Morfaw, C., Jones, L. M., Murray, D., et al. (2011). Seasonal and 2009 H1N1 influenza vaccine uptake, predictors of vaccination and self-reported barriers to vaccination among secondary school teachers and staff. *Human Vaccines, 7*(1), 89-95.

71. Goel, M., Khanna, P., & Mittal, K. (2011). Pandemic influenza A (H1N1) 2009 vaccine: An update. *Indian Journal of Medical Microbiology, 29*(1), 13-18.

72. Gojovic, M. Z., Sander, B., Fisman, D., Krahn, M. D., & Bauch, C. T. (2009). Modelling mitigation strategies for pandemic (H1N1) 2009. *CMAJ, 181*(10), 673-680.

73. Gorman, J. R., & Chambers, C. D. (2011). Pregnant women's feelings toward flu vaccination while breastfeeding. *Birth Defects Research Part A - Clinical and Molecular Teratology.Conference: 51st Annual Meeting of the Teratology Society - 24th International Conference of the Organization of Teratology Information Specialists, OTIS and the 35th Annual Meeti(TRUNCATED), 91*(5), 392.

74. Grau, S., Luque, S., Pi-Sunyer, J., Horcajada, J. P., Villar, R., Berenguer, N., et al. (2011). Low adherence to 2009 pandemic influenza A(H1N1) vaccination program among health care workers of a medical centre during the pandemic phase. [Baja adhesion a un programa de vacunacion contra la gripe A (H1N1) pandemica 2009 entre el personal sanitario de una institucion durante la fase de pandemia] *Enfermedades Infecciosas y Microbiologia Clinica, 29*(4), 269-275.

75. Gray, B. A., Lyerly, A., Namey, E., & Swamy, G. K. (2011). H1N1 vaccination during pregnancy: A qualitative study of women's decisions to accept a novel vaccine. *Reproductive Sciences.Conference: 58th Annual Scientific Meeting of the Society for Gynecologic Investigation, SGI 2011 Miami Beach, FL United States.Conference Start: 20110316 Conference End: 20110319.Conference Publication: (Var.Pagings), 18*(3 SUPPL. 1), 234A.

76. Gutkin, C. (2009). Pearls before swine. *Canadian Family Physician, 55*(11), 1159-1160. Retrieved from http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=medl&AN=19910606;

http://sfx.scholarsportal.info/ottawa?sid=OVID:medline&id=pmid:19910606&id=doi:&issn=0008-350X&isbn=&volume=55&issue=11&spage=1159&pages=1159-60&date=2009&title=Canadian+Family+Physician&atitle=Pearls+before+swine.&aulast=Gutkin&pid=%3Cauthor%3EGutkin+C%3C%2Fauthor%3E%3CAN%3E19910606%3C%2FAN%3E%3CDT%3EJournal+Article%3C%2FDT%3E

77. Haghdoost, A. A., Gooya, M. M., & Baneshi, M. R. (2009). Modelling of H1N1 flu in iran. *Archives of Iranian Medicine, 12*(6), 533-541.
78. Halaby, C., & Cataletto, M. (2010). The importance of influenza vaccination for health care providers and asthmatic patients: Highlights of recommendations for the 2009 influenza season. *Journal of Asthma and Allergy Educators, 1*(1), 12-17.
79. Hakim H. Gaur AH. McCullers JA. Motivating factors for high rates of influenza vaccination among healthcare workers. *Vaccine. 29(35):5963-9, 2011 Aug 11*.
80. Healy, C. M., Rench, M. A., & Baker, C. J. (2011). Implementation of cocooning against pertussis in a high-risk population. *Clinical Infectious Diseases : An Official Publication of the Infectious Diseases Society of America, 52*(2), 157-162.
81. Heidebrecht C.L. Foisy J. Pereira J.A. Quan S.D. Willison D.J. Deeks S.L. Finkelstein M. Crowcroft N.S. Buckeridge D.L. Guay M. Sikora C.A. Kwong J.C. Public Health Agency of Canada,Canadian Institutes of Health Research Influenza. (2010). Perceptions of immunization information systems for collecting pandemic H1N1 immunization data within canada's public health community: A qualitative study. *BMC Public Health, 10*, 523.
82. Henteleff, A. C., Heywood, D., Kurbis, C., & Kris, H. (2010). Overcoming inequities - reaching hard to reach populations during H1N1. *Canadian Journal of Infectious Diseases and Medical Microbiology.Conference: 9th Canadian Immunization Conference Quebec*

City, QC Canada.Conference Start: 20101205 Conference End: 20101208.Conference Publication: (Var.Pagings), 21(4), 222-223.

83. Herrera-Valdez, M. A., Cruz-Aponte, M., & Castillo-Chavez, C. (2011). Multiple outbreaks for the same pandemic: Local transportation and social distancing explain the different "waves" of A-H1N1PDM cases observed in mexico during 2009. *Mathematical Biosciences and Engineering, 8*(Mathematical Models, Challenges, and Lessons Learned from the 2009 A/H1N1 Influenza Pandemic.), 21-48.
84. Hidiroglu, S., Ay, P., Topuzoglu, A., Kalafat, C., & Karavus, M. (2010). Resistance to vaccination: The attitudes and practices of primary healthcare workers confronting the H1N1 pandemic. *Vaccine, 28*(51), 8120-8124.
85. How to win trust over flu.(2009). *Nature, 461*(7265), 698.
86. Hu, S. S., Yang, L. I., Chen, S. H., Wang, X. F., Han, Y. F., & Zhang, W. F. (2011). Intention to accept pandemic H1N1 vaccine and the actual vaccination coverage in nurses at a chinese children's hospital. *Hong Kong Journal of Paediatrics, 16*(2), 101-106.
87. Huerta-Yez, G., Gallaga, V. A., Reyes, A., Chvez, M. A., & Centena, C. Z. (2011). Immunization versus influenza A H1N1 in patients with systemic lupus erythematosus (SLE). *Journal of Rheumatology.Conference: 2nd Mexican-Canadian Congress of Rheumatology Cancun Mexico.Conference Start: 20110210 Conference End: 20110215.Conference Publication: (Var.Pagings), 38*(6), 1205.
88. Hugli, O., Dorribo, V., Lazor-Blanchet, C., & Zanetti, G. (2011). Differential proportion of health care workers immunization against the seasonal and pandemic influenza in 2009 in an emergency department. *Academic Emergency Medicine.Conference: 2011 Annual Meeting of the Society for Academic Emergency Medicine, SAEM Boston, MA United States.Conference Start: 20110601 Conference End: 20110605.Conference Publication: (Var.Pagings), 18*(5 SUPPL. 1), S196.

89. Igari, H., Watanabe, A., Chiba, H., Shoji, K., Segawa, S., Nakamura, Y., et al. (2011). Effectiveness and safety of pandemic influenza A (H1N1) 2009 vaccine in healthcare workers at a university hospital in japan. *Japanese Journal of Infectious Diseases, 64*(3), 177-182.

90. Inoue, Y., & Matsui, K. (2011). Physicians' recommendations to their patients concerning a novel pandemic vaccine: A cross-sectional survey of the 2009 influenza A/H1N1 pandemic in japan. *Environmental Health and Preventive Medicine, 16*(5), 320-326.

91. Jackson, B., Wood, K., Case, R., Motevalli, M., Lockwood, K., Bolton, S., et al. (2011). H1n1 antibody titers in screening healthy individuals as donors for plasma collection. *Transfusion.Conference: AABB Annual Meeting and CTTXPO 2011 San Diego, CA United States.Conference Start: 20111022 Conference End: 20111025.Conference Publication: (Var.Pagings), 51,* 81A.

92. Janssen, A., Tardif, R., Johnson, T., Johnson, V., & O'Connor, J. (2010). In Hyatt Regency Atlanta A.,Georgia (Ed.), *Issues associated with immunization of health care workers against 2009 influenza A (H1N1)*

93. Jeong, H. S., Lee, D. W., Youn, C. H., Lee, M. K., Lee, S. J., Suh, Y. S., et al. (2011). Perception and performance of preventive behaviors for the pandemic influenza in hospital employees and outpatients. *Yonsei Medical Journal, 52*(1), 181-187.

94. Jhao, W. -., Wang, T. -., Ho, L. -., Huang, H. -., Chen, C. -., Chou, Y. -., et al. (2010). A survey in taiwan 2009 for the public perception and the willingness to be vaccinated of pandemic influenza A(H1N1). *International Journal of Infectious Diseases.Conference: 14th International Congress on Infectious Diseases (ICID) Miami, FL United States.Conference Start: 20100309 Conference End: 20100312 Sponsor: Pfizer, Sanofi-Pasteur, American Society for (TRUNCATED), 14,* e97.

95. Johnson, M. L. (2010). Attitudes and beliefs of hutterite mothers toward early childhood immunization in the assiniboine health region in manitoba, canada. *Canadian Journal of Infectious Diseases and Medical Microbiology.Conference: 9th Canadian Immunization Conference Quebec City, QC Canada.Conference Start: 20101205 Conference End: 20101208.Conference Publication: (Var.Pagings), 21*(4), 194-195.
96. Jroundi, I., Mahraoui, C., Maaroufi, A., Benmessaoud, R., Moraleda, C., & Bassat, Q. (2011). Gaps in the current knowledge of acute respiratory infections affecting children under 5 years in morocco. *Tropical Medicine and International Health.Conference: 7th European Congress on Tropical Medicine and International Health Barcelona Spain.Conference Start: 20111003 Conference End: 20111006.Conference Publication: (Var.Pagings), 16*, 262-263.
97. Kaboli, F., Astrakianakis, G., Li, G., Guzman, J., Naus, M., & Donovan, T. (2010). Influenza vaccination and intention to receive the pandemic H1N1 influenza vaccine among healthcare workers of british columbia, canada: A cross-sectional study. *Infection Control and Hospital Epidemiology, 31*(10), 1017-1024.
98. Kane, E. M. (2009). Achieving clinical equality in an influenza pandemic: Patent realities. *Seton Hall Law Review, 39*(4), 1137-1172.
99. Katriel, G., & Stone, L. (2010). Pandemic dynamics and the breakdown of herd immunity. *PloS One, 5*(3), e9565.
100. Keefe, S. C., & Cooze, H. D. (2010). Cold chain distribution strategies implemented to overcome unique challenges in rural communities. *Canadian Journal of Infectious Diseases and Medical Microbiology.Conference: 9th Canadian Immunization Conference Quebec City, QC Canada.Conference Start: 20101205 Conference End: 20101208.Conference Publication: (Var.Pagings), 21*(4), 195-196.

101. Kent, J. N., Lea, C. S., Fang, X., Novick, L. F., & Morgan, J. (2010). Seasonal influenza vaccination coverage among local health department personnel in north carolina, 2007-2008. *American Journal of Preventive Medicine, 39*(1), 74-77.

102. Khowaja, Z. A., Soomro, M. I., Pirzada, A. K., Yoosuf, M. A., & Kumar, V. (2011). Awareness of the pandemic H1N1 influenza global outbreak 2009 among medical students in karachi, pakistan. *Journal of Infection in Developing Countries, 5*(3), 151-155.

103. Kiviniemi, M. T., Ram, P. K., Kozlowski, L. T., & Smith, K. M. (2011). Perceptions of and willingness to engage in public health precautions to prevent 2009 H1N1 influenza transmission. *BMC Public Health, 11*, 152.

104. Kmietowicz, Z. (2009). Opposition to swine flu vaccine among health staff and the public seems to be growing worldwide. *BMJ: British Medical Journal (Overseas & Retired Doctors Edition), 339*, 476-476.

105. Kraut, A., Graff, L., & McLean, D. (2011). Behavioral change with influenza vaccination: Factors influencing increased uptake of the pandemic H1N1 versus seasonal influenza vaccine in health care personnel. *Vaccine, 29*(46), 8357-8363.

106. Kuiken, T., van den Brand, J., van Riel, D., Pantin-Jackwood, M., & Swayne, D. E. (2010). Comparative pathology of select agent influenza a virus infections. *Veterinary Pathology, 47*(5), 893-914.

107. La Torre, G., Di Thiene, D., Cadeddu, C., Ricciardi, W., & Boccia, A. (2009). Behaviours regarding preventive measures against pandemic H1N1 influenza among italian healthcare workers, october 2009. *Euro Surveillance : Bulletin Europeen Sur Les Maladies Transmissibles = European Communicable Disease Bulletin, 14*(49), 19432.

108. Laguna-Torres, V. A., Gomez, J., Ocana, V., Aguilar, P., Saldarriaga, T., Chavez, E., et al. (2009). Influenza-like illness sentinel surveillance in peru. *PloS One, 4*(7), e6118.

109. Lalande, L., Lamarre, E., Hoffmann, E., & Ducher, M. (2011). Impact of a vaccination campaign against influenza a in a hospital. *International Journal of Clinical Pharmacy.Conference: 39th ESCP European Symposium on Clinical Pharmacy and 13th SFPC Congress: Clinical Pharmacy at the Front Line of Innovations Lyon France.Conference Start: 20101021 Conference End: 20101023.C(TRUNCATED), 33*(2), 405-406.

110. Larson, R. C., & Nigmatulina, K. R. (2010). Engineering responses to pandemics. *Studies in Health Technology and Informatics, 153*, 311-339.

111. Lau, J. T. F., Griffiths, S., Choi, K. -., & Lin, C. (2010). Prevalence of preventive behaviors and associated factors during early phase of the H1N1 influenza epidemic. *American Journal of Infection Control, 38*(5), 374-380.

112. Lau JT, Yeung NC, Choi KC, Cheng MY, Tsui HY, Griffiths S.

a. Acceptability of A/H1N1 vaccination during pandemic phase of influenza A/H1N1 in Hong Kong: Population based cross sectional survey. *BMJ.* 2009;339:b4164.

113. Lautenbach, E., Saint, S., Henderson, D. K., & Harris, A. D. (2010). Initial response of health care institutions to emergence of H1N1 influenza: Experiences, obstacles, and perceived future needs. *Clinical Infectious Diseases : An Official Publication of the Infectious Diseases Society of America, 50*(4), 523-527.

114. Layton, D., Rutherford, D., MacDonald, T. M., Shakir, S., & Mackenzie, I. S. (2010). Pilot swine flu vaccination active surveillance study: Interim results. *Drug Safety.Conference: 10th Annual Meeting of the International Society of Pharmacovigilance, ISoP 'Pharmacovigilance in the Global Village' Accra Ghana.Conference Start: 20101103 Conference End: 20101106.Conference Publication: (Var.Pagings), 33*(10), 898-899.

115. Le Saux, N. M., Grenon, R., Barrowman, N., & Samson, L. (2010). Increase in influenza vaccination rates: The importance of doctor 'buy-in'. *Canadian Journal of Infectious*

Diseases and Medical Microbiology.Conference: 9th Canadian Immunization Conference Quebec City, QC Canada.Conference Start: 20101205 Conference End: 20101208.Conference Publication: (Var.Pagings), 21(4), 213.

116. Lim, G. H., Deeks, S. L., Simpson, M., Mackie, C., Rosella, L., Achonu, C., et al. (2010). Estimating background rates of guillain-barre syndrome to assist with evaluating safety concerns during a mass pandemic immunization campaign in ontario. *Canadian Journal of Infectious Diseases and Medical Microbiology.Conference: 9th Canadian Immunization Conference Quebec City, QC Canada.Conference Start: 20101205 Conference End: 20101208.Conference Publication: (Var.Pagings), 21*(4), 208-209.
117. Liu, S., Yuan, H., Liu, Y., Du, J., Zhang, X., Wang, J., et al. (2011). Attitudes of seasonal influenza vaccination among healthcare worker and general community population after pandemic influenza A/H1N1 in hangzhou.
118. Lopalco, P. L., Johansen, K., Ciancio, B., De Carvalho Gomes, H., Kramarz, P., & Giesecke, J. (2010). Monitoring and assessing vaccine safety: A european perspective. *Expert Review of Vaccines, 9*(4), 371-380.
119. Maltezou, H. C., Dedoukou, X., Patrinos, S., Maragos, A., Poufta, S., Gargalianos, P., et al. (2010). Determinants of intention to get vaccinated against novel (pandemic) influenza A H1N1 among health-care workers in a nationwide survey. *The Journal of Infection, 61*(3), 252-258.
120. Mammas, I., Koutsaftiki, C., Koussouri, M., Tapaki-Papadopoulou, G., Papantzimas, K., Theodoridou, M., et al. (2010). In Nice Acropolis Convention Center N. (Ed.), *Immunization coverage of the greek paediatric health-care workers against A/H1N1 influenza during the winter period 2009-2010*
121. Maroyka, E. M., & Andrawis, M. (2010). Health care workers and influenza vaccination. *American Journal of Health-System Pharmacy*, *67*(1), 25.

122. Marshall, J., L.W, Marshall, B. L., & Valladares, G. (2010). Federal and state public health authority and mandatory vaccination: Is jacobson v massachusetts still valid?. *American Journal of Disaster Medicine, 5*(2), 107-112.

123. Martens, K., Petzel, R., Bardsley, C. H., Simpson, G., & Stake, C. (2011). Health care worker availability in a mass casualty incident: Impact of the 2009 H1 n1 influenza pandemic. *Academic Emergency Medicine.Conference: 2011 Annual Meeting of the Society for Academic Emergency Medicine, SAEM Boston, MA United States.Conference Start: 20110601 Conference End: 20110605.Conference Publication: (Var.Pagings), 18*(5 SUPPL. 1), S82-S83.

124. MARTIN, S. D. (2011). Nurses' ability and willingness to work during pandemic flu. *Journal of Nursing Management, 19*(1), 98-108.

125. Maurer, J., Uscher-Pines, L., & Harris, K. M. (2010). Awareness of government seasonal and 2009 H1N1 influenza vaccination recommendations among targeted US adults: The role of provider interactions. *American Journal of Infection Control, 38*(6), 489-490. Retrieved from http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=medl&AN=20591535; http://sfx.scholarsportal.info/ottawa?sid=OVID:medline&id=pmid:20591535&id=doi:&issn=0196-6553&isbn=&volume=38&issue=6&spage=489&pages=489-90&date=2010&title=American+Journal+of+Infection+Control&atitle=Awareness+of+government+seasonal+and+2009+H1N1+influenza+vaccination+recommendations+among+targeted+US+adults%3A+the+role+of+provider+interactions.&aulast=Maurer&pid=%3Cauthor%3EMaurer+J%3BUscher-Pines+L%3BHarris+KM%3C%2Fauthor%3E%3CAN%3E20591535%3C%2FAN%3E%3CDT%3EJournal+Article%3C%2FDT%3E

126. Mavros, M. N., Mitsikostas, P. K., Kontopidis, I. G., Moris, D. N., Dimopoulos, G., & Falagas, M. E. (2011). H1N1v influenza vaccine in greek medical students. *European Journal of Public Health, 21*(3), 329-332.

127. May, L., Katz, R., Johnston, L., Sanza, M., & Petinaux, B. (2010). Assessing physicians' in training attitudes and behaviors during the 2009 H1N1 influenza season: A cross-sectional survey of medical students and residents in an urban academic setting. *Influenza and Other Respiratory Viruses, 4*(5), 267-275.

128. McCarthy, C. M., & Arya, A. (2010). Swine flu vaccination: Uptake and determinants of vaccination in pregnant women and hospital staff in ireland. *Archives of Disease in Childhood: Fetal and Neonatal Edition.Conference: 14th Annual Conference of the British Maternal and Fetal Medicine Society Gateshead United Kingdom.Conference Start: 20100610 Conference End: 20100611.Conference Publicatio(TRUNCATED), 95*, Fa44.

129. McDonnell, C., Gallagher, J., DunnGalvin, A., & Hourihane, J. (2010). Immunise everyone else but me! belief barriers to pandemic H1N1 influenza vaccination among health care workers presenting for seasonal influenza A vaccination. *Allergy: European Journal of Allergy and Clinical Immunology.Conference: 29th Congress of the European Academy of Allergy and Clinical Immunology, EAACI London United Kingdom.Conference Start: 20100605 Conference End: 20100609.Conference Publica(TRUNCATED), 65*, 143.

130. Medlin, K., Lingerfeldt, B., Clinard, V., Barnes, C., Cisneros, R., & Green, M. (2010). Patient motivators for receiving seasonal influenza vaccine. *Journal of the American Pharmacists Association.Conference: APhA2010 Washington, DC United States.Conference Start: 20100312 Conference End: 20100315.Conference Publication: (Var.Pagings), 50*(2), 237.

131. Meng, E. H., Day, T., Arino, J., Wu, J., & Moghadas, S. M. (2010). Strategies for the use of oseltamivir and zanamivir during pandemic outbreaks. *Canadian Journal of Infectious Diseases and Medical Microbiology, 21*(1), e28-e63.

132. Miller, E., Hoschler, K., Hardelid, P., Stanford, E., Andrews, N., & Zambon, M. (2010). Incidence of 2009 pandemic influenza A H1N1 infection in england: A cross-sectional serological study. *The Lancet, 375*(9720), 1100-1108.

133. Miller, S., Cerulli, J., Abrons, J., Vadala, T., & Towers, T. (2010). Defining the pharmacist's role in the pandemic outbreak of novel H1N1 influenza. *Journal of the American Pharmacists Association.Conference: APhA2010 Washington, DC United States.Conference Start: 20100312 Conference End: 20100315.Conference Publication: (Var.Pagings), 50*(2), 275.

134. Mitchell, R., Astrakianakis, G., Bryce, E., Gervais, R., Gravel, D., Johnston, L., et al. (2011). Self-reported influenzavaccination, illness and absenteeism among canadian healthcare workers during the 2009 H1N1 influenza pandemic. *Canadian Journal of Infectious Diseases and Medical Microbiology.Conference: AMMI Canada-CACMID 2011 Annual Conference Abstracts Montreal, QC Canada.Conference Start: 20110407 Conference End: 20110409.Conference Publication: (Var.Pagings), 22*, 13A-14A.

135. Moghadas, S. M., Pizzi, N. J., Wu, J., Tamblyn, S. E., & Fisman, D. N. (2011). Canada in the face of the 2009 H1N1 pandemic. *Influenza and Other Respiratory Viruses, 5*(2), 83-88.

136. Mooney, H. (2009). Don't reject the swine flu vaccine. *Nursing Times, 105*(41), 8.

137. Moore, C. N., Kerrigan, J., Knak, K. V., Weibel, K., Landreth, R. L., Maschmeier, C. S., et al. (2010). The flu and you: Information to keep you forewarned and forearmed. *American Journal of Infection Control.Conference: APIC 37th Annual Educational Conference and International Meeting New Orleans, LA United States.Conference Start:*

20100711 Conference End: 20100715.Conference Publication: (Var.Pagings), 38(5), E22-E23.

138. Morefield, G. L. (2011). A rational, systematic approach for the development of vaccine formulations. *The AAPS Journal, 13*(2), 191-200.

139. Mousavi, S. F., Kheiri, M. T., Hosseini, S. M., Taghizadeh, M., Fotouhi, F., Heydarchi, B., et al. (2011). Phylogenetic comparison of influenza virus isolates from three medical centers in tehran with the vaccine strains during 2008-2009. *Iranian Journal of Medical Sciences, 36*(3), 172-177.

140. Mulvey, A., Carroll, C., Gunko, A., McEnroe, S., Nurhaidar, M., Tempany, M., et al. (2010). Keeping children safe. *Acta Paediatrica, International Journal of Paediatrics.Conference: 2nd Excellence in Paediatrics Conference London United Kingdom.Conference Start: 20101202 Conference End: 20101204.Conference Publication: (Var.Pagings), 99*, 118.

141. Myers, A. L., Lantos, J., Douville, L., & Jackson, M. A. (2010). Healthcare worker knowledge and attitudes regarding influenza immunization and childhood vaccination. *Infection Control & Hospital Epidemiology*, *31*(6), 643-646. Retrieved from http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=medl&AN=20415576; http://sfx.scholarsportal.info/ottawa?sid=OVID:medline&id=pmid:20415576&id=doi:&issn=0899-823X&isbn=&volume=31&issue=6&spage=643&pages=643-6&date=2010&title=Infection+Control+%26+Hospital+Epidemiology&atitle=Healthcare+worker+knowledge+and+attitudes+regarding+influenza+immunization+and+childhood+vaccination.&aulast=Myers&pid=%3Cauthor%3EMyers+AL%3BLantos+J%3BDouville+L%3BJackson+MA%3C%2Fauthor%3E%3CAN%3E20415576%3C%2FAN%3E%3CDT%3EJournal+Article%3C%2FDT%3E

142. Naing, C., & Tan, R. Y. P. (2011). Knowledge about the pandemic influenza A (H1N1) and willingness to accept vaccination: A cross-sectional survey. *Journal of Public Health, 19*(6), 511-516.

143. Nassar, A., Usta, I., Awwad, J., Ghulmiyyah, L., Khoury, S., & Ghazeeri, G. (2010). Attitudes of women towards influenza a (H1N1) vaccination during pregnancy. *Journal of Maternal-Fetal and Neonatal Medicine.Conference: 22nd European Congress of Perinatal Medicine, 2010 Granada Spain.Conference Start: 20100526 Conference End: 20100529.Conference Publication: (Var.Pagings), 23*, 389.

144. Nassif, J. M., Gentry, A., & Biletchi, J. (2010). The power of collecting individual level vaccine data using an immunization information system during pandemic H1N1 influenza. *Canadian Journal of Infectious Diseases and Medical Microbiology.Conference: 9th Canadian Immunization Conference Quebec City, QC Canada.Conference Start: 20101205 Conference End: 20101208.Conference Publication: (Var.Pagings), 21*(4), 225.

145. National Center for Immunization and Respiratory Diseases,CDC.Centers for Disease Control and Prevention (CDC). (2009). Use of influenza A (H1N1) 2009 monovalent vaccine: Recommendations of the advisory committee on immunization practices (ACIP), 2009. *Morbidity & Mortality Weekly Report.Recommendations & Reports, 58*(RR-10), 1-8. Retrieved from http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=medl&AN=19713882; http://sfx.scholarsportal.info/ottawa?sid=OVID:medline&id=pmid:19713882&id=doi:&issn=1057-5987&isbn=&volume=58&issue=10&spage=1&pages=1-8&date=2009&title=Morbidity+%26+Mortality+Weekly+Report.+Recommendations+%26+Reports&atitle=Use+of+influenza+A+%28H1N1%29+2009+monovalent+vaccine%3A+recommendations+of+the+Advisory+Committee+on+Immunization+Practices+%28ACI

P%29%2C+2009.&aulast=National+Center+for+Immunization+and+Respiratory&pid=%3Cauthor%3ENational+Center+for+Immunization+and+Respiratory+Diseases%2C+CDC%3BCenters+for+Disease+Control+and+Prevention+%28CDC%29%3C%2Fauthor%3E%3CAN%3E19713882%3C%2FAN%3E%3CDT%3EGuideline%3C%2FDT%3E

146. Navsaria, D. (2010). Voices from the field: Part V. *Current Problems in Pediatric and Adolescent Health Care, 40*(3), 63-64.

147. Naz, H., Cevik, F., & Aykin, N. (2009). Influenza vaccination in healthcare workers. *Journal of Infection in Developing Countries, 3*(1), 50-54. Retrieved from http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=medl&AN=19749449; http://sfx.scholarsportal.info/ottawa?sid=OVID:medline&id=pmid:19749449&id=doi:&issn=1972-2680&isbn=&volume=3&issue=1&spage=50&pages=50-4&date=2009&title=Journal+of+Infection+in+Developing+Countries&atitle=Influenza+vaccination+in+healthcare+workers.&aulast=Naz&pid=%3Cauthor%3ENaz+H%3BCevik+F%3BAykin+N%3C%2Fauthor%3E%3CAN%3E19749449%3C%2FAN%3E%3CDT%3EJournal+Article%3C%2FDT%3E

148. Nicoll, A., Ammon, A., Amato Gauci, A., Ciancio, B., Zucs, P., Devaux, I., et al. (2010). Experience and lessons from surveillance and studies of the 2009 pandemic in europe. *Public Health, 124*(1), 14-23.

149. Nishiura, H., & Iwata, K. (2009). A simple mathematical approach to deciding the dosage of vaccine against pandemic H1N1 influenza. *Euro Surveillance, bulletin europeen sur les maladies transmissibles = European communicable disease bulletin. 14 (45*

150. Norman, L. J., & Murphy, K. P. (2010). A case study on novel H1N1. *Oncology Nursing Forum, 37*(5), 545-546.

151. Nougairede, A., Lagier, J. -., Ninove, L., Sartor, C., Badiaga, S., Botelho, E., et al. (2010). Likely correlation between sources of information and acceptability of A/H1N1 swine-origin influenza virus vaccine in marseille, france. *PLoS ONE, 5 (6) , 2010*, ate of Pubaton: 2010.

152. Ohara, Y. (2010). Communication between health care professionals and patients. *Rinsho Byori.the Japanese Journal of Clinical Pathology, 58*(6), 595-605.

153. Opstelten, W., van Essen, G. A., Heijnen, M. -., Ballieux, M. J. P., & Goudswaard, A. N. (2010). High vaccination rates for seasonal and pandemic (A/H1N1) influenza among healthcare workers in dutch general practice. *Vaccine, 28*(38), 6164-6168.

154. Oria, P. A., Matini, W., Nelligan, I., Emukule, G., Scherzer, M., Oyier, B., et al. (2011). Are kenyan healthcare workers willing to receive the pandemic influenza vaccine? results from a cross-sectional survey of healthcare workers in kenya about knowledge, attitudes and practices concerning infection with and vaccination against 2009 pandemic influenza A (H1N1), 2010. *Vaccine, 29*(19), 3617-3622.

155. Ortigado, A., Olloqui, A., Mazario, G. J., Eliana, R., Cid, E., & Bustos, J. J. (2010). Kawasaki disease and H1N1 influenza a virus: A case report. *Acta Paediatrica, International Journal of Paediatrics.Conference: 2nd Excellence in Paediatrics Conference London United Kingdom.Conference Start: 20101202 Conference End: 20101204.Conference Publication: (Var.Pagings), 99,* 89.

156. Other duties suffered but IPs rose to occasion: IPs must make ethical decisions.(2010). *Hospital Infection Control & Prevention, 37*(4), 41-43.

157. Ozer, A., Kirecci, E., Ekerbicer, H. C., & Celik, M. (2011). Medical faculty and school of health student knowledge of and behavior regarding swine flu and vaccine, in kahramanmaras, turkey. *The Southeast Asian Journal of Tropical Medicine and Public Health, 42*(1), 161-167.

158. Paget, W. J., Balderston, C., Casas, I., Donker, G., Edelman, L., Fleming, D., et al. (2010). Assessing the burden of paediatric influenza in europe: The european paediatric influenza analysis (EPIA) project. *European Journal of Pediatrics, 169*(8), 997-1008.

159. Pan, D. (2010). A newly discovered viral enzyme capable of alteration of nucleic acid structure via phosphotriester and phosphodiester bonding complex: An event leading to a new frontier of research and development for viral diseases. *International Journal of Infectious Diseases.Conference: 14th International Congress on Infectious Diseases (ICID) Miami, FL United States.Conference Start: 20100309 Conference End: 20100312 Sponsor: Pfizer, Sanofi-Pasteur, American Society for (TRUNCATED), 14,* e459-e460.

160. Pano-Pardo, J. R., Martin-Quiros, A., Romero-Gomez, M., Maldonado, J., Martin-Vega, A., Rico-Nieto, A., et al. (2011). Perspectives from spanish infectious diseases professionals on 2009 A (H1N1) influenza: The third half. *Clinical Microbiology and Infection : The Official Publication of the European Society of Clinical Microbiology and Infectious Diseases, 17*(6), 845-850.

161. Pereira, J. A., Foisy, J., Kwong, J. C., Heidebrecht, C., Quach, S., Quan, S., et al. (2010). A cost comparison of electronic and hybrid data collection systems in ontario during pandemic and seasonal influenza vaccination campaigns. *Canadian Journal of Infectious Diseases and Medical Microbiology.Conference: 9th Canadian Immunization Conference Quebec City, QC Canada.Conference Start: 20101205 Conference End: 20101208.Conference Publication: (Var.Pagings), 21*(4), 210.

162. Pierce, J., J.R, Kellie, S. M., West, T. A., Richardson, J. M., Neale, D. A., et al. (2009). Top ten list of long-term care facility preparations for the upcoming influenza seasons. *Journal of the American Geriatrics Society, 57*(12), 2318-2323.

163. Placidi, D., Franco, G., Bacis, M., Belotti, L., Biggi, N., Carrer, P., et al. (2010). Focus on coverage and promotion of anti influenza vaccine in health workers: Results and

perspectives of a multicenter working group. [Focus so copertura e promozione della vaccinazione antinfluenzale nei lavoratori della sanita: risultati e prospettive di un gruppo di lavoro multicentrico] *Giornale Italiano Di Medicina Del Lavoro Ed Ergonomia, 32*(3), 286-291.

164. Poalillo, F. E., Geiling, J., & Jimenez, E. J. (2010). Healthcare personnel and nosocomial transmission of pandemic 2009 influenza. *Critical Care Medicine, 38*(4 Suppl), e98-102. Retrieved from http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=medl&AN=20154603; http://sfx.scholarsportal.info/ottawa?sid=OVID:medline&id=pmid:20154603&id=doi:&issn=0090-3493&isbn=&volume=38&issue=4&spage=e98&pages=e98-102&date=2010&title=Critical+Care+Medicine&atitle=Healthcare+personnel+and+nosocomial+transmission+of+pandemic+2009+influenza.&aulast=Poalillo&pid=%3Cauthor%3EPoalillo+FE%3BGeiling+J%3BJimenez+EJ%3C%2Fauthor%3E%3CAN%3E20154603%3C%2FAN%3E%3CDT%3EJournal+Article%3C%2FDT%3E
165. Poland, G. A. (2010). The 2009-2010 influenza pandemic: Effects on pandemic and seasonal vaccine uptake and lessons learned for seasonal vaccination campaigns. *Vaccine, 28*(SUPPL. 4), 3-13.
166. Prevost, P., Daveluy, A., Moore, N., Miremont-Salame, G., & Haramburu, F. (2010). Vaccination campaign against A(H1N1)v influenza: The point of view of the team of the department of pharmacology of bordeaux. *Fundamental and Clinical Pharmacology.Conference: 14th Annual Meeting of the French Society of Pharmacology and Therapeutics, the 77th Annual Meeting of the Society of Physiology, the 31st Pharmacovigilance Meeting, the 11th APNET Seminar and Th(TRUNCATED), 24*, 93.

167. Printza, N., Farmaki, E., Bosdou, J., Gkogka, C., & Papachristou, F. (2010). Pandemic influenza A 2009 (H1N1) vaccination in high risk children with chronic renal diseases: Acceptance and perceptions. *Human Vaccines, 6*(10), 819-822.

168. Pulford, A., & Malcolm, W. (2010). Knowledge and attitudes to reporting adverse drug reactions. *British Journal of Nursing (Mark Allen Publishing), 19*(14), 899-904.

169. Querci, M., Herrera, F., Temporiti, E., Alcala, W., Figueras, L., Barberis, F., et al. (2010). Novel influenza A H1N1 infection among healthcare workers. *International Journal of Infectious Diseases.Conference: 14th International Congress on Infectious Diseases (ICID) Miami, FL United States.Conference Start: 20100309 Conference End: 20100312 Sponsor: Pfizer, Sanofi-Pasteur, American Society for (TRUNCATED), 14*, e83-e84.

170. Rachiotis, G., Mouchtouri, V. A., Kremastinou, J., Gourgoulianis, K., & Hadjichristodoulou, C. (2010). Low acceptance of vaccination against the 2009 pandemic influenza A(H1N1) among healthcare workers in greece. *Euro Surveillance : Bulletin Europeen Sur Les Maladies Transmissibles = European Communicable Disease Bulletin, 15*(6), 19486.

171. Raude, J., Caille-Brillet, A. L., & Setbon, M. (2010). The 2009 pandemic H1N1 influenza vaccination in france: Who accepted to receive the vaccine and why?. *PLoS Currents, 2*, RRN1188. Retrieved from http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=prem&AN=20972476; http://sfx.scholarsportal.info/ottawa?sid=OVID:medline&id=pmid:20972476&id=doi:&issn=2157-3999&isbn=&volume=2&issue=&spage=RRN1188&pages=RRN1188&date=2010&title=PLoS+currents&atitle=The+2009+pandemic+H1N1+influenza+vaccination+in+France%3A+who+accepted+to+receive+the+vaccine+and+why%3F.&aulast=Raude&pid=%3Caut

hor%3ERaude+J%3BCaille-Brillet+AL%3BSetbon+M%3C%2Fauthor%3E%3CAN%3E20972476%3C%2FAN%3E%3CDT%3EJournal+Article%3C%2FDT%3E

172. Rega, P., Bork, C., Chen, Y., Woodson, D., Hogue, P., & Batten, S. (2010). Using an H1N1 vaccination drive-through to introduce healthcare students and their faculty to disaster medicine. *American Journal of Disaster Medicine, 5*(2), 129-136.

173. Ribeiro, A., Pellini, A. C. G., Carvalhanas, T. R. M. P., Liphaus, B. D. L., Yu, A. L. F. L. F., Freitas, G. D., et al. (2010). Factors associated to death in patients with confirmed diagnosis for influenza A/H1N1. state of sao paulo, brazil, april to october, 2009. *International Journal of Infectious Diseases.Conference: 14th International Congress on Infectious Diseases (ICID) Miami, FL United States.Conference Start: 20100309 Conference End: 20100312 Sponsor: Pfizer, Sanofi-Pasteur, American Society for (TRUNCATED), 14*, e95.

174. Rizzo, C., Rota, M. C., Bella, A., Giannitelli, S., De Santis, S. D., Nacca, G., et al. (2010). Response to the 2009 influenza A (H1N1) pandemic in italy. *Eurosurveillance, 15*(49), 6.

175. Rodrguez Brito, C. E., Rubio Lorente, A. M., Bueno Pacheco, G., Pascual Pedreo, A., & Chereki Koulop, M. (2010). Pregnant women and virus of influenza a (H1N1). clinical presentation and treatment. *Journal of Maternal-Fetal and Neonatal Medicine.Conference: 22nd European Congress of Perinatal Medicine, 2010 Granada Spain.Conference Start: 20100526 Conference End: 20100529.Conference Publication: (Var.Pagings), 23*, 540.

176. Rodrguez-Romo, R., Morales-Buenrostro, L. E., Marino-Vzquez, L. L., Mata, J., Cancino, J., Espinoza, R., et al. (2010). Practice and attitude toward influenza vaccination before and during 2009 outbreak in kidney transplant recipients, family members and healthcare providers. *American Journal of Transplantation.Conference: American Transplant*

Congress 2010, ATC 2010 San Diego, CA United States.Conference Start: 20100501 Conference End: 20100505.Conference Publication: (Var.Pagings), 10, 385.

177. Rubin, J. L., McGarry, L. J., Klugman, K. P., Strutton, D. R., Gilmore, K. E., & Weinstein, M. C. (2010). Public health and economic impact of vaccination with 7-valent pneumococcal vaccine (PCV7) in the context of the annual influenza epidemic and a severe influenza pandemic. *BMC Infectious Diseases, 10,* 14.

178. Rurik, I., Langmar, Z., Marton, H., Kovacs, E., Szigethy, E., & Ilyes, I. (2011). Knowledge, motivation, and attitudes of hungarian family physicians toward pandemic influenza vaccination in the 2009/10 influenza season: Questionnaire study. *Croatian Medical Journal, 52*(2), 134-140. Retrieved from http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=medl&AN=21495195; http://sfx.scholarsportal.info/ottawa?sid=OVID:medline&id=pmid:21495195&id=doi:&issn=0353-9504&isbn=&volume=52&issue=2&spage=134&pages=134-40&date=2011&title=Croatian+Medical+Journal&atitle=Knowledge%2C+motivation%2C+and+attitudes+of+Hungarian+family+physicians+toward+pandemic+influenza+vaccination+in+the+2009%2F10+influenza+season%3A+questionnaire+study.&aulast=Rurik&pid=%3Cauthor%3ERurik+I%3BLangmar+Z%3BMarton+H%3BKovacs+E%3BSzigethy+E%3BIlyes+I%3C%2Fauthor%3E%3CAN%3E21495195%3C%2FAN%3E%3CDT%3EJournal+Article%3C%2FDT%3E

179. Sanchez-Paya, J., Hernandez-Garcia, I., Barrenengoa Sanudo, J., Rolando Martinez, H., Camargo Angeles, R., Cartagena Llopis, L., et al. (2011). Determinants of influenza vaccination in health staff: 2009-2010 season. [Determinantes de la vacunacion antigripal en personal sanitario, temporada 2009-2010] *Gaceta Sanitaria / S.E.S.P.A.S, 25*(1), 29-34.

180. Sanchez-Paya, J., Hernandez-Garcia, I., Barrenengoa-Sanudo, J., Camargo-Angeles, R., Rincon, A., & Romero-Candeira, S. (2010). Frequency and factors associated with adverse reactions following the administration of influenza vaccine in personal health during the 2009-2010 season. [Frecuencia de reacciones adversas y factores asociados tras la administracion de la vacuna de la gripe en personal sanitario durante la temporada 2009-2010] *Revista Espanola De Salud Publica, 84*(6), 851-859.

181. Savas, E., & Tanriverdi, D. (2010). Knowledge, attitudes and anxiety towards influenza A/H1N1 vaccination of healthcare workers in turkey. *BMC Infectious Diseases, 10*, 281.

182. Scheide, D. (2010). Exploring influenza vaccination as a condition of employment: One hospital's journey. *American Journal of Infection Control.Conference: APIC 37th Annual Educational Conference and International Meeting New Orleans, LA United States.Conference Start: 20100711 Conference End: 20100715.Conference Publication: (Var.Pagings), 38*(5), E48.

183. Schneeberg, A., Chong, M., Bettinger, J., & Naus, M. (2010). Pandemic h1n1 influenza vaccine post-campaign survey: H1N1 immunization coverage and public attitudes in british columbia (BC). *Canadian Journal of Infectious Diseases and Medical Microbiology.Conference: 9th Canadian Immunization Conference Quebec City, QC Canada.Conference Start: 20101205 Conference End: 20101208.Conference Publication: (Var.Pagings), 21*(4), 181.

184. Schwarzinger, M., Verger, P., Guerville, M. A., Aubry, C., Rolland, S., Obadia, Y., et al. (2010). Positive attitudes of french general practitioners towards A/H1N1 influenza-pandemic vaccination: A missed opportunity to increase vaccination uptakes in the general public?. *Vaccine, 28*(15), 2743-2748. Retrieved from http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=medl&AN=20117271;

http://sfx.scholarsportal.info/ottawa?sid=OVID:medline&id=pmid:20117271&id=doi:&issn=0264-410X&isbn=&volume=28&issue=15&spage=2743&pages=2743-8&date=2010&title=Vaccine&atitle=Positive+attitudes+of+French+general+practitioners+towards+A%2FH1N1+influenza-pandemic+vaccination%3A+a+missed+opportunity+to+increase+vaccination+uptakes+in+the+general+public%3F.&aulast=Schwarzinger&pid=%3Cauthor%3ESchwarzinger+M%3BVerger+P%3BGuerville+MA%3BAubry+C%3BRolland+S%3BObadia+Y%3BMoatti+JP%3C%2Fauthor%3E%3CAN%3E20117271%3C%2FAN%3E%3CDT%3EJournal+Article%3C%2FDT%3E

185. Seale, H., Kaur, R., Wang, Q., Yang, P., Zhang, Y., Wang, X., et al. (2011). Acceptance of a vaccine against pandemic influenza A (H1N1) virus amongst healthcare workers in beijing, china. *Vaccine, 29*(8), 1605-1610.

186. Seale, H., & Macintyre, C. R. (2011). Seasonal influenza vaccination in australian hospital health care workers: A review. *Medical Journal of Australia, 195*(6), 336-338. Retrieved from http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=prem&AN=21929498; http://sfx.scholarsportal.info/ottawa?sid=OVID:medline&id=pmid:21929498&id=doi:&issn=0025-729X&isbn=&volume=195&issue=6&spage=336&pages=336-8&date=2011&title=Medical+Journal+of+Australia&atitle=Seasonal+influenza+vaccination+in+Australian+hospital+health+care+workers%3A+a+review.&aulast=Seale&pid=%3Cauthor%3ESeale+H%3BMacintyre+CR%3C%2Fauthor%3E%3CAN%3E21929498%3C%2FAN%3E%3CDT%3EJournal+Article%3C%2FDT%3E

187. Sencer, D. J. (2011). Perspective: Swine-origin influenza: 1976 and 2009. *Clinical Infectious Diseases, 52*(SUPPL. 1), S4-S7.

188. Sertogullarindan, B., Ozbay, B., Gunini, H., Sunnetcioglu, A., Arisoy, A., Bilgin, H. M., et al. (2011). Clinical and prognostic features of patients with pandemic 2009 influenza a (H1N1) virus in the intensive care unit. *African Health Sciences, 11*(2), 163-170.

189. Sevencan, F., Ertem, M., Ozcullu, N., Dorman, V., & Kubat, N. K. (2011). The evaluation of the opinions and attitudes of healthcare personnel of the province diyarbakir against influenza A (H1N1) and the vaccination. *Human Vaccines, 7*(9), 945-951.

190. Sharomi, O., Podder, C. N., Gumel, A. B., Mahmud, S. M., & Rubinstein, E. (2011). Modelling the transmission dynamics and control of the novel 2009 swine influenza (H1N1) pandemic. *Bulletin of Mathematical Biology, 73*(3), 515-548.

191. Sharrocks, K., & Fox, J. (2010). Poor uptake of swine flu vaccination in an HIV-infected cohort - what is it about vaccines?. *HIV Medicine.Conference: 2nd Joint Conference of the British HIV Association and the British Association for Sexual Health and HIV Manchester United Kingdom.Conference Start: 20100420 Conference End: 20100423.Conference Publication: (Var.Pagings), 11,* 66.

192. Sikora, C., McKim, B., & Johnson, M. (2010). Staff perceptions of efficiency of vaccine delivery in the 2009/10 pH1N1 mass vaccination campaign in alberta, canada. *Canadian Journal of Infectious Diseases and Medical Microbiology.Conference: 9th Canadian Immunization Conference Quebec City, QC Canada.Conference Start: 20101205 Conference End: 20101208.Conference Publication: (Var.Pagings), 21*(4), 228.

193. Sikora, C., McKim, B., & Johnson, M. (2010). A survey of information sources utilized by patients attending pH1N1 mass vaccination clinics in alberta, canada. *Canadian Journal of Infectious Diseases and Medical Microbiology.Conference: 9th Canadian Immunization Conference Quebec City, QC Canada.Conference Start: 20101205 Conference End: 20101208.Conference Publication: (Var.Pagings), 21*(4), 227.

194. Sim, J. A., Ulanika, A. A., Katikireddi, S. V., & Gorman, D. (2011). 'Out of two bad choices, I took the slightly better one': Vaccination dilemmas for scottish and polish migrant women during the H1N1 influenza pandemic. *Public Health, 125*(8), 505-511.

195. Smith, K. J., Raymund, M., Nowalk, M. P., Roberts, M. S., & Zimmerman, R. K. (2010). Cost-effectiveness of pneumococcal polysaccharide vaccine among healthcare workers during an influenza pandemic. *American Journal of Managed Care, 16*(3), 200-206.

196. Stavroulopoulos, A., Stamogiannos, G., & Aresti, V. (2010). Pandemic 2009 influenza H1N1 virus vaccination: Compliance and safety in a single hemodialysis center. *Renal Failure, 32*(9), 1044-1048.

197. Steiner, I., Budka, H., Chaudhuri, A., Koskiniemi, M., Sainio, K., Salonen, O., et al. (2010). Viral meningoencephalitis: A review of diagnostic methods and guidelines for management. *European Journal of Neurology, 17*(8), 999-1009.

198. Suresh, P. S., Thejaswini, V., & Rajan, T. (2011). Factors associated with 2009 pandemic influenza A (H1N1) vaccination acceptance among university students from india during the post-pandemic phase. *BMC Infectious Diseases, 11*, 205.

199. Tagajdid, R., Annaz, H. E., Doblali, T. K., Sefiani, K., Belfquih, B., & Mrani, S. (2010). Healthcare worker acceptance of pandemic (H1N1) 2009 vaccination, morocco. *Emerging Infectious Diseases, 16*(10), 1638-1639.

200. Tanguy, M., Boyeau, C., Pean, S., Marijon, E., Delhumeau, A., & Fanello, S. (2011). Acceptance of seasonal and pandemic a (H1N1) 2009 influenza vaccination by healthcare workers in a french teaching hospital. *Vaccine, 29*(25), 4190-4194.

201. Tellez, I. (2010). Febrile illnesses. *International Journal of Infectious Diseases.Conference: 14th International Congress on Infectious Diseases (ICID) Miami, FL United States.Conference Start: 20100309 Conference End: 20100312 Sponsor: Pfizer, Sanofi-Pasteur, American Society for (TRUNCATED), 14*, e172.

202. Thoon, K. C., & Chong, C. Y. (2010). Survey of healthcare workers' attitudes, beliefs and willingness to receive the 2009 pandemic influenza A (H1N1) vaccine and the impact of educational campaigns. *Annals of the Academy of Medicine, Singapore, 39*(4), 307-306.

203. To, K. -., Lee, S., Chan, T. -., & Lee, S. -. (2010). Exploring determinants of acceptance of the pandemic influenza A (H1N1) 2009 vaccination in nurses. *American Journal of Infection Control, 38*(8), 623-630.

204. Toback, S. L., Carr, W., Hackell, J., Bhatt, P., Ryan, A., & Ambrose, C. S. (2011). Influenza vaccination of parents and guardians by US pediatricians.

205. Torun, S. D., & Torun, F. (2010). Vaccination against pandemic influenza A/H1N1 among healthcare workers and reasons for refusing vaccination in istanbul in last pandemic alert phase. *Vaccine, 28*(35), 5703-5710.

206. Torun, S. D., Torun, F., & Catak, B. (2010). Healthcare workers as parents: Attitudes toward vaccinating their children against pandemic influenza A/H1N1. *BMC Public Health, 10,* 596.

207. Turpin, M., & Laderoute, I. (2010). H1N1 vaccine campaign a tremendous success: Lessons learned. *Canadian Journal of Infectious Diseases and Medical Microbiology.Conference: 9th Canadian Immunization Conference Quebec City, QC Canada.Conference Start: 20101205 Conference End: 20101208.Conference Publication: (Var.Pagings), 21*(4), 173.

208. Use of influenza A (H1N1) 2009 monovalent vaccine: Recommendations of the advisory committee on immunization practices (ACIP), 2009.(2009). *MMWR.Recommendations and Reports : Morbidity and Mortality Weekly Report.Recommendations and Reports / Centers for Disease Control, 58*(RR-10) (pp 1-8), ate of Pubaton: 28 Aug 2009.

209. Vance, M. A. (2011). Disease mongering and the fear of pandemic influenza. *International Journal of Health Services : Planning, Administration, Evaluation, 41*(1), 95-115.

210. Velasco, E., Salluh, J., Goncalves, V. M., Oliveira, V., Moreno, T., & Rocco, S. (2010). Hospitalized cancer patients with severe infections due to the novel influenza A (H1N1) in brazil. *Clinical Microbiology and Infection.Conference: 20th ECCMID Vienna Austria.Conference Start: 20100410 Conference End: 20100413.Conference Publication: (Var.Pagings), 16,* S110-S111.

211. Villanueva-Ruiz, C., Snchez-Pay, J., Cartagena-Llopis, L., Barrenengoa-Sanudo, J., Camargo-Angeles, R., Martnez, H. R., et al. (2010). Influenza vaccination coverage among healthcare workers and determinants of vaccination during the 2009-2010 season. *Journal of Hospital Infection.Conference: 7th International Conference of the Hospital Infection Society Liverpool United Kingdom.Conference Start: 20101010 Conference End: 20101013.Conference Publication: (Var.Pagings), 76,* S51.

212. Virseda, S., Restrepo, M. A., Arranz, E., Magan-Tapia, P., Fernandez-Ruiz, M., de la Camara, A. G., et al. (2010). Seasonal and pandemic A (H1N1) 2009 influenza vaccination coverage and attitudes among health-care workers in a spanish university hospital. *Vaccine, 28*(30), 4751-4757.

213. Vorou, R., Babatsikou, F., Chalkias, A., & Galani, S. (2010). Hygiene measures during influenza A (H1N1) school outbreaks. *Review of Clinical Pharmacology and Pharmacokinetics, International Edition, 24*(1), 5-12.

214. Wagner, S., Winston, L., & Chan, S. B. (2011). Health care workers and the mandated H1N1 vaccine: A survey to assess employee perception. *Academic Emergency Medicine.Conference: 2011 Annual Meeting of the Society for Academic Emergency*

Medicine, SAEM Boston, MA United States.Conference Start: 20110601 Conference End: 20110605.Conference Publication: (Var.Pagings), 18(5 SUPPL. 1), S220-S221.

215. Wallinga, J., Van Bovena, M., & Lipsitch, M. (2010). Optimizing infectious disease interventions during an emerging epidemic. *Proceedings of the National Academy of Sciences of the United States of America, 107*(2), 923-928.
216. Walter, D., Bohmer, M. M., Heiden, M., Reiter, S., Krause, G., & Wichmann, O. (2011). Monitoring pandemic influenza A(H1N1) vaccination coverage in germany 2009/10 - results from thirteen consecutive cross-sectional surveys. *Vaccine, 29*(23), 4008-4012.
217. Watson, J., Brena, P. P., Bresee, J., Jennings, L., Peiris, M., & Ellis, J. (2010). Panel discussion - aims of respiratory virus surveillance. *Influenza and Other Respiratory Viruses.Conference: International Symposium on Viral Respiratory Disease Surveillance of the International Society for Influenza and Other Respiratory Virus, ISIRV Seville Spain.Conference Start: 20090325 Conferen(TRUNCATED), 4*, 5-6.
218. White, C. D. E. (2010). Want a job? get flu vaccine. *Hospitals and Health Networks, 84*(9), 8.
219. White, S. W., Petersen, R. W., & Quinlivan, J. A. (2010). Pandemic (H1N1) 2009 influenza vaccine uptake in pregnant women entering the 2010 influenza season in western australia. *Medical Journal of Australia, 193*(7), 405-407.
220. Wicker, S., Rabenau, H. F., Betz, W., & Lauer, H. C. (2011). Attitudes of dental healthcare workers towards the influenza vaccination. *International Journal of Hygiene and Environmental Health,*
221. Wicker, S., Rabenau, H. F., Gottschalk, R., Krause, G., & McLennan, S. (2010). Low influenza vaccination rates among healthcare workers. time to take a different approach. [Niedrige Influenzaimpfquoten bei Mitarbeitern im Gesundheitswesen. Zeit fur einen

neuen Ansatz] *Bundesgesundheitsblatt, Gesundheitsforschung, Gesundheitsschutz, 53*(12), 1298-1303.

222. Wood, N., Ho, J., & McIntyre, P. (2011). Influenza vaccines, fever and febrile convulsions in australia in 2010: Implications for future programs. *Journal of Paediatrics and Child Health.Conference: 2011 Paediatrics and Child Health Annual Meeting Darwin, NT Australia.Conference Start: 20110522 Conference End: 20110525.Conference Publication: (Var.Pagings), 47,* 16.

223. Wong SY, Wong EL, Chor J, Kung K, Chan PK, Wong C, et al. Willingness to accept H1N1 pandemic influenza vaccine: a cross-sectional study of Hong Kong community nurses. *BMC Infect Dis 2010;10:316.*

224. Yanni, E. A., Marano, N., Han, P., Edelson, P. J., Blumensaadt, S., Becker, M., et al. (2010). Knowledge, attitudes, and practices of US travelers to asia regarding seasonal influenza and H5N1 avian influenza prevention measures. *Journal of Travel Medicine, 17*(6), 374-381.

225. Yee, S. S., Dutta, P. R., Solin, L. J., Vapiwala, N., & Kao, G. D. (2010). Lack of compliance with national vaccination guidelines in oncology patients receiving radiation therapy. *Journal of Supportive Oncology, 8*(1), 28-34.

226. Yen, M. -. (2010). The role of physicians in preparedness against novel pandemic influenza. *International Journal of Urology.Conference: 10th Asian Congress of Urology of the Urological Association of Asia Taipei Taiwan (Republic of China).Conference Start: 20100827 Conference End: 20100831.Conference Publication: (Var.Pagings), 17,* A27.

227. Yetman, M. M., Moralejo, D., March, P., Mitchell, L., Price, P., Young, J., et al. (2010). HCW H1N1 immunization rates soar to new heights in newfoundland labrador. *Canadian Journal of Infectious Diseases and Medical Microbiology.Conference: 9th Canadian*

Immunization Conference Quebec City, QC Canada.Conference Start: 20101205 Conference End: 20101208.Conference Publication: (Var.Pagings), 21(4), 221.

228. Yudin, M. H. (2011). Optimizing knowledge of antiviral medications for prophylaxis and treatment of influenza during pregnancy. *Expert Review of Respiratory Medicine, 5*(4), 495-501.

229. Zhang, J., While, A. E., & Norman, I. J. (2011). Nurses' knowledge and risk perception towards seasonal influenza and vaccination and their vaccination behaviours: A cross-sectional survey. *International Journal of Nursing Studies, 48*(10), 1281-1289. doi:http://dx.doi.org/10.1016/j.ijnurstu.2011.03.002

Appendix – Section C1

Major and Minor codes for pH1N1 Influenza Vaccine Acceptance Reasons, cited by HCW who reported RECEIVING the pH1N1 vaccine

Pilot inter-coder reliability (i.e.Cohen's Kappa (κ) pre-discussion) for pH1N1 vaccination motivators was calculated to be 85%, final inter-coder reliability (i.e.Cohen's Kappa (κ) post-discussion) was 97%.

1. Personal/Self: Reasons to become vaccinated that relate to the person or individual
**The keywords self, me, I, my should take center stage in all responses that refer to self health*, can include the terms have and get as they imply self/personal*

1.0
Prevention of influenza/flu/sickness in self/I/Me *(keywords prevention, avoid, stop)*
Examples of statements:
- Catching H1N1
- To prevent myself from getting it and sick
- Avoid getting H1N1
- Prevent illness
- Prevent Infection

** If otherwise stated assume general terms regarding prevention and precaution imply self**

1.1
Personal health issues that would increases the risk of Influenza related health complications to self (e.g. asthma, age, cancer)
Examples of statements:
- Compromised immune system
- Chronic Illness
- Have asthma
-Age

1.2
Vaccine will minimized Influenza symptoms/severity in self if infected
Examples of statements:
- Prevent serious respiratory issues
- Personal health - to minimize Symptom Severity
- Risk of severe illness with contracting H1N1

1.3
Improve or preserve self health *(keywords health, well-being, immunity, care)*
Examples of statements:
- My health
- To be immunized
- Keeping myself healthy

** If otherwise stated assume general terms regarding Immunity and Health refer to Personal/Self Motivators**

1.4
Vaccination as a means of self protection from Influenza and personal safety *(keywords protection, safety*)
Examples of statements:
- Protect myself

- My own safety
- Personal protection
- Protection against contracting H1N1

** If otherwise stated assume general terms regarding protection and safety relate to self**

1.5

I am Fearful or scared of Influenza related illness or death (death and fear combined because the majority of statements combine fear and death) *(keywords fear, scared, afraid, death*)

Examples of statements:

- Fear of Contracting
- To no die
- Fear of diseases and/or death

** This code also includes fear as a general term as this refers to personal feelings.
If otherwise stated assume general terms regarding Fear and Death relate to Personal/Self Motivators**

1.6

Null code (would not apply to self - left in so all the other codes match up)

1.7

Self *(general does not specify)*

Examples of statements:

- Self
- Personal
- For me

1.8

Self compounded statements *(included with other reasons)*, but first concern is stated to be self.

Examples of statements:

- For myself to care for others
-Protect self/others
- To protect myself, my family and patients from what was expected to be a highly contagious and potentially very serious pandemic

1.9

Reduce the RISK of influenza/infection/sickness for self (inherently different from prevention) *(keywords reduce, lower, decrease)*

Examples of statements:

- Reduce personal Risk
- Decrease risk of getting infected
- Lessen chance of acquiring H1N1

** This code also includes general terms that relate to reduce the chance/risk of infection.
If otherwise stated assume relate to Personal/Self Motivators**

<u>2. Family Members (Loved Ones): Reasons to become vaccinated that relate to Family members/Loved ones</u>

** key words children, spouse, siblings, parents, friends, partner, husband, and any other family members should take center stage in all responses that refer to family members, loved ones and friends**

2.0

Prevention of influenza/flu/sickness in Family Members *(keywords prevention, avoid, stop)*

Examples of statements:

- Prevent family from getting the disease
- Keep family from getting sick
- Not infect friends

2.1

Family members have health issues that would increase their risk of Influenza related health complications (e.g. asthma, age, cancer)

Examples of statements:

- Family member with a chronic health condition
- Mother-in-law is immuno-sufficient
- My father has health problems and getting pH1N1 would be dangerous for him

2.2

Specific Family Member/Loved One. The relationship or various characteristic of the family member are provided in an attempt to demonstrate that the family member is at risk of influenza (i.e infant child, elderly mother etc). Independent of but closely related to 2.1 and 2.7

Examples of statements:

- My infant child at home
- My son goes to daycare
- Grandparents or Grandchildren

2.3

Improve or preserve the health/immunity of Family Members via vaccine uptake *(keywords health well-being, or immunity)*

Examples of statements:

- My husband's Health
- Immunity for family and friends
- Family health concerns

2.4

Vaccination as a means of protecting family members from Influenza or ensuring the safety of Family Members *(keywords protection, safety*)

Examples of statements:

- Protecting my family
- Family safety
- Keep family and friends safe

2.5

I am fearful or scared of causing influenza related illness among Family Members, Fearful or scared of family members being sick with H1N1 *(keywords fear, scared, afraid*)

Examples of statements:

- Fear of children getting sick with H1N1
- Fear of infecting family
- Scared that my family will become sick with H1N1

2.6

Prevent spread to Family Members *(keyword infect, spread, transmission, pass)*. The idea that vaccination was motivated by the belief that the HCW themselves can transfer the infection to family members

Examples of statements:

- Not bring influenza home to family
- Prevent influenza spread to family members
- To not transfer illness to friends and family members

2.7

Family Members *(general does not specify)* Independent of but closely related to 2.3

Examples of statements:

- For my family and friends
- Family

2.8

Family Members compounded statements *(included with other reasons)*, but the first reason is stated to be family members

Examples of statements:

- Protect my family and myself
- Take care of my family and patients without getting sick

2.9

Family Members/loved ones encouraged/motivated HCW to become vaccinated

Examples of statements:

- Parents influence
- Family Influence
- My husband strongly encouraged me to have the vaccine to protect possibly infecting my kids

<u>3. Patients: Reasons to become vaccinated that relate to Patients</u>

** keywords patients, clients should take center stage in all responses that refer to family member**

3.0

Prevention of influenza/flu/sickness in Patients in general *(keywords prevention, avoid, stop)*

Examples of statements:

- Prevent my patients from getting the disease
- Stop H1N1 in patients

3.1

Work with or among patients with health issues that increase their risk of Influenza related health complications (e.g. at risk patients, cancer, age, cancer)

Examples of statements:

- Work with elderly patients
- Protect vulnerable patient populations
- Primary caregiver to Cancer patient
- My patients are immuno-compromised and at high risk

3.2

Null code

3.3

Health and/or immunity among patients via self-vaccination *(keywords health, immune system, or immunity)*

Examples of statements:

- My patient's health
- Safety of hospital patients
- Keep my patients healthy

Includes statements that relate to patient care

3.4

Vaccination as a means of protecting patients from Influenza *(keywords protection, safety*)

Examples of statements:

- Patient protection
- Patient safety
- Safety of clients
- Reducing infectious load in hospital to protect our patients

3.5

I am fearful or scared of causing influenza related illness among patients members *(keywords fear, scared, afraid*)

Examples of statements:

- I am scared of infecting patients

3.6.

Prevent Spread to Patients *(keywords spread, infect, infect, transmission)*. The idea that vaccination was motivated by the belief that the HCW themselves can transfer the infection to patients

Examples of statements:

- Prevent spread to patients
- Not spreading H1N1/flu to patients
- Prevent patients from catching pH1N1 from me

3.7

Patients *(general does not specify)*

Examples of statements:

- For my Patients
- The patients I work with
- In-patient population

3.8

Patients compounded statements *(included with other reasons),* but the first reason is stated to be patients

Examples of statements:

- To not infect patients and staff
- To prevent infection to patients/coworkers/work-related

3.9

Null Code

4. Co-workers/Colleagues: Reasons to become vaccinated that relate to Colleagues or Co-workers

** keywords colleagues, other staff, supervisor, people I work with**

4.0

Prevention of influenza/flu/sickness in Co-workers *(keywords prevention, avoid, stop)*

Examples of statements:

- Prevent co-workers from getting influenza
- Stop H1N1 among staff

4.1

Work with colleagues with health issues that increase their risk of Influenza related health complications (e.g. at risk patients, cancer, age, cancer)

Examples of statements:

4.2

Null code

4.3

Health and/or immunity of among other colleagues via self-vaccination *(keywords health, immune system, or immunity)*

Examples of statements:

- My Co-workers health
- My colleague's health

4.4

Vaccination as a means of protecting colleagues from Influenza *(keywords protection, safety*)

Examples of statements:

- To protect my colleagues
- My co-worker's protection

4.5

I am fearful or scared of causing influenza related illness among colleagues *(keywords fear, scared, afraid*)

4.6

Prevent Spread to Colleagues *(key spread)*

Examples of statements:

- Did not want to infect colleagues
- Staff I work with getting it therefore decrease risk of staff getting it
- Not to spread the virus to co-workers

4.7

Colleagues *(general does not specify)*

Examples of statements:

- Co-workers
- Colleagues
- People I work with

4.8

Colleagues compounded statements *(included with other reasons)*

Examples of statements:

- Protect coworkers/patients
- Staff/patients

4.9

Colleagues/supervisors/other staff members encouraged or motivated HCW to become vaccinated

Examples of statements:

- Encouraged by manager
- Staff encouraged me
- I got the vaccine to make my boss happy
- My supervisor encouraged me to

** Includes general terms that relate to Peer Pressure**

5. Community and or Society: Reasons to become vaccinated that relate to the general community or society.

keywords others, society, population, community

5.0

Prevention of influenza/flu/sickness within the community *(keywords prevention, avoid, stop)*

Examples of statements:

- Prevent others from getting sick
- Stop H1N1 in the community

5.1

Protecting others (especially at risk of influenza complications)

Examples of statements:

- Prevent H1N1 in vulnerable populations
- Protecting others with a chronic illness

5.2
Specifically Herd Immunity
Examples of statements:
- Contribute to "herd immunity"

5.3
Health and Wellbeing of Others
Examples of statements:
- Health of the community
- The health and wellbeing of others

5.4
Vaccination as a means of protecting others *(keywords protection, safety*)
Examples of statements:
- To protect my community
- The safety of others
- Protection for anyone I have contact with

5.5
I am fearful or scared of causing influenza related illness in others *(keywords fear, scared*)

5.6
Spread and Transmission of H1N1/infection ((*keywords spread, transfer, transmission)*
Examples of statements:
- To break the transmission (chain)
- Prevent spread of H1N1
- Did not want to expose others to H1N1
- Decrease risk of propagating (infection) to population(s) in general

Includes general statements that relate to general transmission and spread, as well as spread at work

5.7
Others *(general does not specify)*

5.8
Others *(included with other reasons)*

5.9
Public pressure, to be vaccinated, pressure from others (includes social responsibility)
Examples of statements:
- Social Responsibility
- Civic duty

<u>6. HCW Status/Occupation: Reasons to become vaccinated that relate to HCW status, Occupation, Employment, or Workplace</u>
keywords duty, responsibility, job, occupation, healthcare worker
** This category considers school to be an occupation as study sample includes student HCW who are training in a hospital environment **

6.1
HCW status implicates influenza vaccination
Examples of statements:
- All HCW should be vaccinated

- It is my duty to be vaccinated
- Duty of care
- It is the right thing to do in a health care workplace

6.2
HCW status increases risk/likelihood of influenza infection to self
Examples of statements:
- As health care worker, high risk
- I could have caught it easily from patients
- Exposure to H1N1 at work
- I work in a hospital and could get or spread H1N1

Includes general statements that implicates HCW to be a high risk population, or refers to contact with patients with H1N1

6.3
Absenteeism (relates to workload burden associated with missing work)
Examples of statements:
- I do not want to miss work
- I have too much work to do
- Available to work
- Remain productive
- Loss of work will put me back too much - work backlog

6.4
Financial factors, pressures of missing work *(keywords money, sick leave, afford*)
Examples of statements:
- I can not afford to miss work
- I can't afford to be off without pay should an outbreak occur (as per Hosp corp. policy)
- Being able to work/get paid
- Didn't want to miss any work-not getting paid

Includes statements that relate to workplace policy where a HCW would not be paid for sick leave if they are not vaccinated

6.5
Vaccination made Compulsory by employer (school) (*keywords policy, mandatory, pressure, recommended, forced)*
Examples of statements:
- The hospital made me
- Mandatory for school, BScN program
- Recommended by the hospital
- No choice
- My employer strongly recommends it

Includes general statements that relate to implicates HCW being forced to become vaccinated

6.6
To be a Role Model/Demonstrate leadership to others, closely related to 4.9
Examples of statements:
- To influence my staff to be immunized
- Role model
- So that my family would be immunized

6.7
Work (general statements) non-specific unsure if the motivator is self, HCW status, or patient population (*keywords hospital, work, school, HCW)*

Examples of statements:
- I work in healthcare
- My work environment
- Where I work

7<u>Alternative Reasons: Alternative reasons for vaccination that do not fit with the above categories</u> (could not be included in any of the other broader themes)

7.1
Out of Habit
Examples of statements:
- I always get vaccinated
- I do so every year

7.2
Advised by a physician to get the vaccine
Examples of statements:
- My Doctor thought it was a good idea
- My MD asked me to be vaccinated

7.3
Vaccine was conveniently available (*ke words accessibility, availability, convenience)*
Examples of statements:
- The vaccine was free
- Easy to access
- The vaccine was offered at work

7.4
Confidence or Belief in Immunization/ the effectiveness of the vaccine (*keywords safe, effective)*
Examples of statements:
- Scientific evidence
- The vaccine will work
- Correct strain
- I believe in immunization

Includes non-specific statements that implicate confidence in influenza immunization

7.5
Pregnancy, any reason relating to pregnancy self, others, or the possibility of becoming pregnant)
Examples of statements:
- I was trying to get pregnant
- My wife was pregnant The vaccine was free
- Fetal wellbeing pregnant

7.6
Travel (*keywords travel, trip, vacation, and holiday)*
Examples of statements:
- Traveling overseas
- Travelling to Europe
- Mexican Trip

<u>9. Other Reasons that could not be coded: Reasons for vaccination that were Too specific to be grouped into an existing category or did not seem really make sense</u>

10. Reported receiving the vaccine but no reasons for vaccination uptake provided

11. Reported NOT receiving the pandemic Influenza Vaccine

12. Factors specific to pandemic influenza: Reasons to become vaccinated that relate to the H1N1 pandemic

12.0
Pandemic/Epidemic nature of H11N1 (*keywords pandemic, epidemic, outbreak)*
Examples of statements:
- Prevent H1N1 pandemic from happening
- Stop an H1N1 outbreak
- Pandemic response

12.1
The pandemic was severe or different from the sINFLU, various characteristics symptoms specific to H1N1
Examples of statements:
- Young people were most effected/death
- People were dying from the disease
- Higher mortality associated with this influenza
- Healthy people were affected severely/died
- pH1N1 is a new influenza we didn't know much

12.2
Public health authority motivators to be vaccinated
Examples of statements:
- Because the government urged us to do so
- Public education indicating its benefits

12.3
Media related motivators to be vaccinated
(*keywords hype, hysteria)*
Examples of statements:
- Fear created by the media
- Media propaganda/hysteria

Includes non-specific statements that relate to media

Major and Minor themes for pH1N1 Influenza Vaccine Refusal, cited by HCW who reported refusing the vaccine

Pilot inter-coder reliability for pH1N1 barriers (i.e.Cohen's Kappa (κ) pre-discussion) was 73% and final inter-coder reliability (i.e.Cohen's Kappa (κ) post-discussion) was 91%.

1. Personal/Self: Reasons for NOT being vaccinated that relate to the person or individual
*The keywords self, me, I, my should take center stage in all responses that refer to self health**

1.0
Vaccination not considered as being important or necessary for self
Examples of statements:
- I don't need/require the vaccine
- I am not at risk of influenza
- Didn't think I needed it
- I did not want this vaccine

1.1
Personally/Self of good/sound health that I do not require the vaccine (*keywords health, strong immune system, or immunity)*
Examples of statements:
- My immune system will take care of it
- I believe in letting my immune system fight off any germs/infections etc
- Low risk
- I don't think it's necessary for a healthy individual

1.2
Do not get sick or become infected with influenza (Vaccination/Immunization to influenza not necessary).
Examples of statements:
- I never get sick
- I have never had the flu

1.3
I am NOT Fearful, concerned, or scared of H1N1 Influenza/ or influenza *(keywords fear, scared, afraid*) in the context of sINFLU.

1.4
Report adverse events AE to previous influenza vaccination or other types of immunization, includes previous reactions to the vaccine
(keywords adverse events, ill, adverse reactions, side-effects)
- The vaccine made me sick
- I had severe headaches after getting the influenza vaccine a few years ago
- Previous anaphylactic type reaction to seasonal flu shot

Includes report of specific AE (e.g. hives), these statements specifically refer to HCW being vaccinated in the past and having undesired effects. Includes advise from MD to not become vaccinated due to a pervious SE

1.5
Null Code

1.6
Personal choice/Belief that relate to no belief/mistrust of influenza vaccination
- My reasons for not getting it are my own and no one else's business
- I don't believe in getting vaccinated for everything out there
- Personal Choice

- Not convinced
- I do not trust the vaccine

Includes non-specific statements that relate to mistrust of immunization, and any religious beliefs

1.7

Afraid of Needles/Vaccination *(keywords: injections shots)*

Examples of statements:

- I not like injections
- I am scared of needles

1.8

Already had H1N1 influenza, Report immunity due to previous self-reported H1N1 infection

1.9

Confidence in alternative methods of avoiding influenza infection (e.g hand washing, homeopathic remedies)

2.0 Vaccine related **The key words vaccine, flu shot, influenza, immunization should take center stage in all responses that refer to the influenza vaccine**

- Adjuvant

2.1

Vaccine Safety (*keywords: not safe, dangerous)*

Examples of statements:

- Vaccine safety questions
- I don't believe in poisoning myself
- GBS/ bells palsy
- Do not have confidence in the safety of the ingredients used in the production and storage of influenza vaccines in general

**Includes statements that relate death from immunization, implies issues with vaccine safety, or specific/dangerous conditions linked to immunization (i.e. GBS, autoimmune disorders), and issues with vaccine ingredients and adjuvant **

2.2

Vaccine efficacy/effectiveness

Examples of statements:

- The vaccine will not work
- The vaccine does not/will not prevent influenza
- Little data proving effectiveness/side effects of formulation

2.3

Limitations in knowledge/information (i.e. vaccine manufacturing, vaccine R&D processes) (*keywords: development, testing, manufacturing, research, development)*

Examples of statements:

- Not enough research on the vaccine
- Not tested adequately
- The Vaccine was developed quickly
- Vaccine was too new - not enough testing of vaccine or understanding of H1N1

Includes statements that relate to the vaccine being novel or the long-term effects being unknown, and general statements on long-term effects

2.4

General Side-effects or Allergies that alluded to be vaccine uptake *(keywords allergy, side-effects*)

Examples of statements:

- Possible side effects to the vaccine
- Allergic reaction

**not really referring to any personal experiences with the vaccine, but rather general statements about the vaccine side-effects and allergies **

2.5
Fearful of the vaccine, or vaccine related outcomes (i.e. side-effects)

2.6
The Vaccine causes sickness, including influenza

Examples of statements:

- The vaccine causes influenza
- The vaccine makes me Ill
- Greater chance of getting flu if receive vaccine

3. Alternative Reasons: reasons for vaccine refusal that do not fit with the above categories (could not be included in any of the other broader themes)

3.1
Time

Examples of statements:

- I did not have time to get the vaccine
- no time
- busy

3.2
HCW status/Patient contact absent (i.e Vaccine issue no longer applies)

Examples of statements:

- On leave
- On vacation
- was not working at the time
- Off on maternity leave

**Includes statements that relate to the HCW not having direct patient contact in their role or position **

3.3
The pandemic was misrepresented by External sources (i.e media, public health authorities, and/or pharmaceutical companies) *(keywords: media, conspiracy, propaganda, hysteria)*

Examples of statements:

- Media hysteria turned me off
- Exaggerating seriousness proven that media and WHO over did it
- Did not agree with how public health used scare tactics to make people get it - very poorly "rolled" out

**Includes general statements regarding media, public health authorities, and/or pharmaceutical companies **

3.4
Do not become immunized for influenza (routine)

Examples of statements:

- I never get the flu shot
- Didn't get it (vaccine) last year

3.5
Medical reasons for not being vaccinated, excludes allergies

Examples of statements:

- I had major surgery
- Trying on get pregnant

Includes Advised/Discouraged against vaccination by a physician

8. Compounded Reasons (e.g mention self and patients)

9. Other reasons that could not be coded

10. Report refusing the vaccine but no reasons are provided

11. Received the pH1N1 vaccine

Major and Minor Themes for sINFLU Vaccine Acceptance Reasons, cited by HCW who reported RECEIVING the sINFLU vaccine

Pilot inter-coder reliability for sINFLU vaccination motivators was calculated to be (i.e.Cohen's Kappa (κ) pre-discussion) 78%, final inter-coder reliability (i.e.Cohen's Kappa (κ) post-discussion) was 89%.

1. Personal/Self **The key words self, me, I, my should take center stage in all responses that refer to self health*, can include the terms have and get as they imply self/personal*

1.0

Prevention of influenza/flu/sickness in self/I/Me *(key words prevention, avoid, stop)*

Examples of statements:

- Prevent influenza in me
- Prevent infection in me
- Avoid influenza/sickness

** If otherwise stated assume general terms regarding prevention and precaution imply self**

1.1

Personal health issues that would increases the risk of Influenza related health complications to self (e.g. asthma, age, cancer)

Examples of statements:

- Compromised immune system
- Chronic Illness
- Have asthma
- Age

1.2

Vaccine will minimized Influenza symptoms/severity in self if infected

Examples of statements:

- Won't be as bad if I do get sick

1.3

Improve or preserve self health *(key words health, healthy well-being, immunity, care)*

Examples of statements:

- For health
- To decrease chance of getting
- My own health and immunity

** If otherwise stated assume general terms regarding Immunity and Health refer to Personal/Self Motivators**

1.4

Vaccination as a means of self protection from Influenza and personal safety from infection *(key word protection, safety*)

Examples of statements:

- Protect myself
- My own safety
- Personal protection
- Protection against contracting H1N1

** If otherwise stated assume general terms regarding Immunity and Health refer to Personal/Self Motivators**

1.5

I am Fearful or scared of Influenza related illness or death (combined because the majority of statements combine fear and death) *(key words fear, scared, afraid, death*),

- Fear of Contracting
- To no die
- Fear of diseases and/or death

** This code also includes fear as a general term as this refers to personal feelings.
If otherwise stated assume general terms regarding Fear and Death relate to Personal/Self Motivators**

1.6

Null code (would not apply to self - left in so all the other codes match up)

1.7

Self *(general does not specify)*

Examples of statements:

- Self
- Personal
- For me

1.8

Self compounded statements *(included with other reasons)*, but first concern is stated to be self.

Examples of statements:

- For myself to care for others
-Protect self/others
- To protect myself, my family and patients from what was expected to be a highly contagious and potentially very serious pandemic

1.9

Reduce the risk of influenza/infection/sickness for self (inherently different from prevention) *(key words reduce, lower, decrease)*

Examples of statements:

- Reduce personal Risk
- Decrease risk of getting infected
- Lessen chance of acquiring H1N1

** This code also includes general terms that relate to reduce the chance/risk of infection. If otherwise stated assume relate to Personal/Self Motivators**

2. . Family Members (Loved Ones): Reasons to become vaccinated that relate to Family members/Loved ones

** key words children, spouse, siblings, parents, friends, partner, husband, and any other family members should take center stage in all responses that refer to family members, loved ones and friends**

2.0

Prevention of influenza/flu/sickness in Family Members *(keywords prevention, avoid, stop)*

Examples of statements:

- Prevent the risk of Influenza in children/family members/friends
- Prevent influenza at home
- Avoid influenza in family

2.1

Family members have health issues that would increase their risk of Influenza related health complications (e.g. asthma, age, cancer)

Examples of statements:

- Family member with a chronic health condition
- Mother-in-law is immuno-sufficient
- My father is very sick

2.2

Specific Family Member/Loved One. The relationship or various characteristic of the family member are provided in an attempt to demonstrate that the family member is at risk of influenza (i.e infant child, elderly mother etc). Independent of but closely related to 2.1 and 2.7

Examples of statements:

- My infant child at home
- My son goes to daycare
- Grandparents or Grandchildren

2.3

Improve or preserve the health/immunity of Family Members via vaccine uptake *(keywords health well-being, or immunity)*

Examples of statements:

- My husband's Health
- Immunity for family and friends
- Family health concerns
- Family and friend's health

2.4

Vaccination as a means of protecting family members from Influenza, ensuring the safety of family members *(key word protection, safety*)

Examples of statements:

- Protect my family
- Family safety
- Keep family and friends safe

2.5

I am fearful or scared of causing influenza related illness among Family Members, Fearful or scared of family members being sick with H1N1 *(keywords fear, scared, afraid*)

Examples of statements:

- Fear of children getting sick with flu
- Fear of infecting family
- Scared that my family will become sick with influenza

2.6

Prevent spread to family members *(key spread, transmission)*. The idea that vaccination was motivated by the belief that the HCW themselves can transfer the infection to family members

Examples of statements:

- Not bring influenza home to family
- Prevent influenza spread to family members
- To not transfer illness to friends and family members
- To ensure I did not infect my family

2.7

Family Members *(general does not specify)* Independent of but closely related to 2.3

Examples of statements:

- For my family and friends
- Family

2.8

Family members compounded statements *(included with other reasons)*, but the first reason is stated to be family members

Examples of statements:

- Protect my family and myself
- Take care of my family and patients without getting sick

2.9

Family members/loved ones encouraged/motivated HCW to become vaccinated

Examples of statements:

- Parents influence
- Family Influence
- My husband strongly encouraged me to have the vaccine to protect possibly infecting my kids

3. Patients: Reasons to become vaccinated that relate to Patients

** key words patients, clients should take center stage in all responses that refer to family member**

3.0

Prevention of influenza/flu/sickness in Patients in general *(keywords prevention, avoid, stop)*

Examples of statements:

- Reduce the risk of Influenza among patients
- Prevent influenza in patients

3.1

Work with or among patients with health issues that increase their risk of Influenza related health complications (e.g. at risk patients, cancer, age, cancer)

Examples of statements:

- Work with elderly patients
- Protect vulnerable patient populations
- I work with immune suppressed patients

3.2

Null code

3.3

Health and/or immunity among patients via self-vaccination *(key words health, immune system, or immunity protection)* include statements that relate to patient care..

Examples of statements:

- My patient's health
- Safety of hospital patients
- Keep my patients healthy

3.4

Vaccination as a means of protecting patients from Influenza *(key word protection, safety*)

Examples of statements:

- For patient safety, to prevent them catching flu
- Patient protection

3.5

I am fearful or scared of causing influenza related illness among patients members *(key words fear, scared, afraid*)

Examples of statements:

- I am scared of infecting patients

3.6.

Prevent Spread to Patients *(key spread, infect)*. The idea that vaccination was motivated by the belief that the HCW themselves can transfer the infection to patients members.

Examples of statements:
- Prevent spread to patients
- Not spreading H1N1/flu to patients
- Prevent patients from catching pH1N1 from me

3.7
Patients *(general does not specify)*
Examples of statements:
- For my Patients
- The patients I work with
- In-patient population

3.8
Patients compounded statements *(included with other reasons)* Such as statements that relate to patient contact, but do not specify.
Examples of statements:
- To not infect patients and staff
- To prevent infection to patients/coworkers/work-related

3.9
Null Code

4. Co-workers/Colleagues: Reasons to become vaccinated that relate to Colleagues or Co-workers
** keywords colleagues, other staff, supervisor, people I work with**

4.0
Prevention of influenza/flu/sickness in Co-workers *(keywords prevention, avoid, stop)*
Examples of statements:
- Reduce the risk of Influenza among co-workers
- Prevent influenza in colleagues
- Not infect colleagues

4.1
Work with colleagues with health issues that increase their risk of Influenza related health complications (e.g. at risk patients, cancer, age, cancer)
Examples of statements:

4.2
Null code

4.3
Health and/or immunity of among other colleagues via self-vaccination *(key words health, immune system, or immunity protection)*
Examples of statement:
- My Co-workers health
- My colleague's health

4.4
Vaccination as a means of protecting colleagues from Influenza *(key word protection, safety*)
Examples of statements:
- To protect my colleagues
- My co-worker's protection

4.5

I am fearful or scared of causing influenza related illness among colleagues *(key words fear, scared, afraid*)

4.6
Prevent Spread to colleagues *(keyword spread)*
Examples of statements:
- Did not want to infect colleagues
- Staff I work with getting it therefore decrease risk of staff getting it
- Not to spread the virus to co-workers

4.7
Colleagues *(general does not specify)*
Examples of statements:
- Co-workers
- Colleagues
- People I work with

4.8
Colleagues compounded statements *(included with other reasons)*

4.9
Colleagues/supervisors/other staff members, encouraged/motivated HCW to become vaccinated (includes peer pressure)
Examples of statements:
- Encouraged by hospital management, (i.e. having contests within hospital)

** Includes general terms that relate to Peer Pressure**

5. Community and or Society: Reasons to become vaccinated that relate to the general community or society.
key words others, society, population, community

5.0
Prevention of influenza/flu/sickness within the community *(keywords prevention, avoid, stop)*
Examples of statements:
- Reduce the risk of Influenza in others
- Prevent influenza in others
- Not infect others

5.1
Protecting others (especially at risk of influenza complications)
Examples of statements:
- Protecting others with a chronic illness

5.2
Specifically Herd Immunity

5.3
Health and Wellbeing of others
Examples of statements:
-Public health
-Health of others

5.4
Vaccination as a means of protecting others *(key word protection, safety*)
Examples of statements:

-Public safety

5.5

I am fearful or scared of causing influenza related illness in others *(key words fear, scared*)

5.6

Spread and Transmission of H1N1/infection (*(keywords spread, transfer, transmission)*

Examples of statements:

- To break the transmission (chain)
- Prevent spread of influenza
- Did not want to expose others to influenza
- (stop) spreading illness to general public

Includes general statements that relate to general transmission and spread, as well as spread at work

5.7

Others *(general does not specify)*

5.8

Others *(included with other reasons)*

5.9

Public pressure, to be vaccinated, pressure from others (includes social responsibility)

Examples of statements:

- Social Responsibility
- Civic duty

<u>6. HCW Status/Occupation: Reasons to become vaccinated that relate to HCW status, Occupation, Employment, or Workplace</u>

keywords duty, responsibility, job, occupation, healthcare worker

** This category considers school to be an occupation as study sample includes student HCW who are training in a hospital environment **

6.1

HCW status implicates influenza vaccination **key words duty, responsibility, job, occupation, healthcare worker**

Examples of statements:

- HCW should be vaccinated
- Because of my job
- It is my duty to be vaccinated

6.2

HCW status increases risk/likelihood of influenza infection to self

Examples of statements:

- I am at greater risk because I am a HCW
- I can be infected by the patients I have to care for

Includes general statements that implicates HCW to be a high risk population, or refers to contact with patients with H1N1

6.3

Absenteeism (relates to workload burden associated with missing work)

Examples of statements:

- I do not want to miss work
- I have too much work to do
- Someone else will have to work if I call in sick

6.4

Financial factors, pressures of missing work

Examples of statements:

- Cannot afford to miss work

Includes statements that relate to workplace policy where a HCW would not be paid for sick leave if they are not vaccinated

6.5

Vaccination made Compulsory by employer (and school) **key words policy, mandatory, student, school** *(can include recommended)*

Examples of statements:

- The hospital made us
- To work we had to be vaccinated
- Recommended by the hospital
- School made up take the vaccine for our placement

Includes general statements that relate to implicates HCW being forced to become vaccinated

6.6

To be a Role Model/Demonstrate leadership to others, closely related to 4.9

Examples of statements:

- To influence my staff to be immunized
- Role model
- So that my family would be immunized

6.7

Work (general statements) non-specific unsure if the motivator is self, HCW status, or patient population (*keywords hospital, work, school, HCW)*

7<u>Alternative Reasons: Alternative reasons for vaccination that do not fit with the above categories</u> (could not be included in any of the other broader themes)

7.1

Out of Habit

Examples of statements:

- I always get vaccinated
- I do so every year

7.2

Advised by a physician to get the vaccine

Examples of statements:

- My Doctor thought it was a good idea
- My MD asked me to

7.3

Vaccine was conveniently available * *key words accessibility, availability, convenience**

Examples of statements:

- Vaccine accessibility and availability
- Easy to access
- The vaccine was offered at work
- Vaccine is free

7.4

Confidence or Belief in Immunization and the effectiveness of the vaccine "*key words safe, effective**

Examples of statements:

- The vaccine is safe
- The vaccine is effective
- The vaccine will work
- Correct strain
- I believe in immunization

Includes non-specific statements that implicate confidence in influenza immunization

7.5
Pregnancy (any reason relating to pregnancy self, others, possibility of becoming preg etc.)

7.6
Travel **key words travel, trip, vacation, holiday*
Examples of statements:
- Traveling overseas
- Travelling to Europe
- Mexican Trip

7.7
Public health authority motivators to be vaccinated

7.8
Media related motivators to be vaccinated (includes general statements regarding media)

9. Other Reasons that could not be coded (Too specific or did not really make sense)

10. Reported receiving the vaccine but no reasons for vaccination uptake provided

11. Reported NOT receiving the 2008/2009 sINFLU Vaccine

Major and Minor themes for 2008/2009 sINFLU Vaccine Refusal, cited by HCW who reported refusing the vaccine

Pilot inter-coder (i.e.Cohen's Kappa (κ) pre-discussion) reliability for sINFLU vaccination barriers was calculated to be 64%, final inter-coder reliability (i.e.Cohen's Kappa (κ) post-discussion) was 84%.

1. 1. Personal/Self: Reasons for NOT being vaccinated that relate to the person or individual
*keywords self, me, I, my should take center stage in all responses that refer to self health**

1.0
Vaccination not considered as being important or necessary for self
Examples of statements:
- I don't need/require the vaccine
- I am not at risk of influenza
- Didn't think I needed it
- I did not want this vaccine

1.1
Personally of good/sound health that I do not require the vaccine (*key words health, strong immune system, or immunity)*
Examples of statements:
- My immune system will take care of it
- I have a strong immune system
- I am healthy
- Without the vaccine I can build-up self immunity

1.2
Do not get sick or become infected with influenza (Vaccination/Immunization to influenza not necessary).
Examples of statements:
- I never get sick
- I have never had the flu
-Strong immune system, never had the flu in all my years in healthcare

1.3
I am NOT Fearful, concerned, or scared of sINFLU or influenzas *(key words fear, scared, afraid*) in the context seasonal influenza.

1.4
Report adverse events AE to previous influenza vaccination or other types of immunization, includes previous reactions to the vaccine
(keywords adverse events, ill, adverse reactions, side-effects)
Examples of statements:
- The vaccine made me sick
- Ill from vaccination
-Allergic reactions to HBV vaccination
- Adverse reactions to all previous influenza vaccines received
Includes report of specific AE (e.g. hives), these statements specifically refer to HCW being vaccinated in the past and having undesired effects. Includes advise from MD to not become vaccinated due to a pervious SE

1.5 Null Code

1.6
Personal choice/Belief
- I did not want to
- My decision
- I do not believe in the vaccine

Includes non-specific statements that relate to mistrust of immunization, and any religious beliefs

1.7
Afraid of Needles/Vaccination *(keywords: injections shots)*

Examples of statements:
- I not like injections
- I am scared of needles

1.8
Already had influenza, Report immunity due to previous self-reported infection

1.9
Confidence in alternative methods of avoiding influenza infection (e.g. hand washing, homeopathic remedies)

2.0 Vaccine related **The key words vaccine, flu shot, influenza, immunization should take center stage in all responses that refer to the influenza vaccine**
- Adjuvant

2.1
Vaccine Safety (*keywords: not safe, dangerous)*

Examples of statements:
- The vaccine is not safe
- Vaccine side effects
-I do not want the vaccine ingredients inside me
- Fear of injecting foreign substances into my body

**Includes statements that relate death from immunization, implies issues with vaccine safety, or specific/dangerous conditions linked to immunization (i.e. GBS, autoimmune disorders), and issues with vaccine ingredients and adjuvant **

2.2
Vaccine efficacy/effectiveness

Examples of statements:
- The vaccine will not work
- they never know for sure if this years flu is going to match the vaccine mix
- Don't believe shot actually catches enough strains to be worth it
- It has been proven that vaccines in the past were the "wrong" vaccine,

For sINFLU, includes reasons such as the strain is a best guess scenario, does not accurately predict the dominant strain of the season

2.3
Limitations in the influenza Vaccine Manufacturing, Knowledge, and Research Processes, (*keywords: development, testing, manufacturing, research, development)*

Examples of statements:
- not sufficient research
- not tested adequately

Includes statements that relate to the long-term effects being unknown, and general statements on long-term effects

2.4
General Side-effects or Allergies that alluded to be vaccine uptake *(keywords allergy, side-effects)*
Examples of statements:

- Possible side effects to the vaccine
- Allergic reaction
- - Concern re: long term effects of too many vaccinations

*not really referring to any personal experiences with the vaccine, but rather general statements about the vaccine side-effects and alltergies **

2.5
Fearful of the vaccine, or vaccine related outcomes (i.e. side-effects)

2.6
The Vaccine causes sickness, including influenza
Examples of statements:

- The vaccine causes influenza
- don't want to get sick from vaccine
- had one (vaccine) years ago and was sick from it so I never got it again

3. Alternative Reasons (could not be included in any of the other broader themes)

3.1
Time
Examples of statements:

- I did not have time to get the vaccine
- no time
- busy
- not a priority

3.2
Not working at TOH or at the Hospital during the influenza vaccine campaign
Examples of statements:

- On leave
- On vacation
- was not working at the time
- Off on maternity leave
- Not working with vulnerable population - started at hospital Dec '09

**Includes statements that relate to the HCW not having direct patient contact in their role or position **

3.3
Media/Public Health Authorities/Pharmaceutical Companies over-exaggerates influenza , conspiracy theory
(keywords: media, conspiracy, propaganda)
Examples of statements:

- Don't want government to track me
- Feeling pressured by work

3.4
Do not become immunized for influenza (routine)
Examples of statements:

- Never bother to get the shot

3.5

Medical reasons for not being vaccinated, excludes allergies
- I was in treatment for cancer - chemo/radiation
- I had major surgery
- Pregnancy
Includes Advised/Discouraged against vaccination by a physician

8. Compounded Reasons (e.g mention self and patients)

9. Other reasons that could not be coded

10. Report refusing the vaccine but no reasons are provided

12. Received the sINFLU vaccine

pH1N1 Motivators (overall)

Code		Frequency	Proportion	Proportion per Theme
1.0	Prevent influenza in self	714	8.5	
1.1	Personal health issues	167	2.0	
1.2	Minimize influenza symptoms	41	0.5	
1.3	Self health	432	5.1	
1.4	Self protection/safety	652	7.7	
1.5	Fearful of infection	152	1.8	
1.7	Self: GENERAL STATEMENT	86	1.0	
1.8	Self: COMPOUNDED STATEMENT	42	0.5	
1.9	Reduce risk of infection	77	0.9	28.1
2.0	Prevent influenza friends and family	62	0.7	
2.1	Friends/family member health issues	75	0.9	
2.2	Family members: specific	187	2.2	
2.3	Friends/family member health	112	1.3	
2.4	Friends/family member protection	655	7.8	
2.5	Fearful for friends/family member influenza	16	0.2	
2.6	Prevent spread to Friends/family member	347	4.1	
2.7	Friends/family member: GENERAL STATEMENT	200	2.4	
2.8	Friends/family member: COMPOUNDED STATEMENT	32	0.4	
2.9	Friends/family member encouragement	23	0.3	20.3
3.0	Prevent influenza in patients	23	0.3	
3.1	Working with at risk patients	55	0.7	
3.3	Patient Health	56	0.7	
3.4	Patient protection/safety	417	5.0	
3.5	Fearful for patient influenza	5	0.1	
3.6	Prevent spread to patients	163	1.9	
3.7	Patients: GENERAL STATEMENT	116	1.4	
3.8	Patients: COMPOUNDED STATEMENT	78	0.9	10.8
4.3	Colleagues health	9	0.1	
4.4	Colleagues protection/safety	32	0.4	
4.6	Prevent spread to colleagues	13	0.2	
4.7	Colleagues: GENERAL STATEMENT	34	0.4	
4.8	Colleagues: COMPOUNDED STATEMENT	31	0.4	
4.9	Colleague/supervisor encouragement	92	1.1	2.5
5.0	Prevent influenza in community (other individuals)	15	0.2	
5.1	Protecting individuals at risk	5	0.1	
5.2	Herd immunity: SPECIFIC	19	0.2	
5.3	Other individual's health	23	0.3	
5.4	Other individual's protection/safety	95	1.1	
5.6	Prevent spread to other individuals	593	7.0	
5.7	Other individuals: GENERAL STATEMENTS	11	0.1	
5.8	Other individuals: COMPOUNDED STATEMENT	3	.0	
5.9	Public pressure/motivation	24	0.3	9.4
6.1	HCW status implicates vaccination	30	0.4	
6.2	HCW at increased occupational risk	129	1.5	
6.3	Absenteeism	157	1.9	
6.4	Financial factors	56	0.7	
6.5	HCW vaccination compulsory, workplace policy	358	4.9	
6.6	To be a Role Model to other HCW	29	0.3	
6.7	HCW/Work: GENERAL STATEMENTS	168	1.2	9.8
7.2	Physician recommended vaccination	33	0.4	
7.3	Vaccine conveniently available	112	1.3	
7.4	Belief/confidence in immunization	57	0.7	
7.5	Pregnant	20	0.2	
7.6	Travel	22	0.3	2.9

9.0	Uncodeable Reasons	62	0.7	0.7
12.0	Pandemic/epidemic nature of H1N1	71	0.8	
12.1	H1N1 more sever, different from s.influenza	82	1.0	
12.3	Media related motivators encouragement	10	0.1	2.0
10.0	Reasons not provided	1139	13.5	13.5
	Total	*8424*	*100.0*	

Note: the proportions and counts within and between tables may not add up because of rounding errors, and because missing values and codes with 0 proportions were excluded from the final tables

pH1N1 Motivators (TOP, primary reason)

Code		Frequency	Proportion	Proportion per Theme
1.0	Prevent influenza in self	519	18.2	
1.1	Personal health issues	81	2.8	
1.2	Minimize influenza symptoms	12	0.4	
1.3	Self health	283	9.9	
1.4	Self protection/safety	382	13.4	
1.5	Fearful of infection	82	2.9	
1.7	Self: GENERAL STATEMENT	17	0.6	
1.8	Self: COMPOUNDED STATEMENT	15	0.5	
1.9	Reduce risk of infection	44	1.5	50.2
2.0	Prevent influenza friends and family	13	0.5	
2.1	Friends/family member health issues	43	1.5	
2.2	Family members: specific	100	3.5	
2.3	Friends/family member health	19	0.7	
2.4	Friends/family member protection	184	6.4	
2.5	Fearful for friends/family member influenza	1		
2.6	Prevent spread to Friends/family member	83	2.9	
2.7	Friends/family member: GENERAL STATEMENT	63	2.2	
2.9	Friends/family member encouragement	7	0.2	18.0
3.0	Prevent influenza in patients	3	0.1	
3.1	Working with at risk patients	26	0.9	
3.3	Patient Health	8	0.3	
3.4	Patient protection/safety	57	2.0	
3.5	Fearful for patient influenza	1		
3.6	Prevent spread to patients	25	0.9	
3.7	Patients: GENERAL STATEMENT	22	0.8	
3.8	Patients: COMPOUNDED STATEMENT	7	0.2	5.2
4.6	Prevent spread to colleagues	1		
4.7	Colleagues: GENERAL STATEMENT	5	0.2	
4.9	Colleague encouragement	38	1.3	1.5
5.0	Prevent influenza in community (other individuals)	1		
5.1	Protecting individuals at risk	2	0.1	
5.2	Herd immunity: SPECIFIC	6	0.2	
5.3	Other individual's health	1		
5.4	Other individual's protection/safety	7	0.2	
5.6	Prevent spread to other individuals	115	4.0	
5.9	Public pressure/motivation	4	0.1	4.8
6.1	HCW status implicates vaccination	7	0.2	
6.2	HCW at increased occupational risk	57	2.0	
6.3	Absenteeism	16	0.6	
6.4	Financial factors	20	0.7	
6.5	HCW vaccination compulsory, workplace	66	2.3	

	policy			
6.6	To be a Role Model to other HCW	6	0.2	
6.7	HCW/Work: GENERAL STATEMENTS	105	3.7	9.7
7.2	Physician recommended vaccination	6	0.2	
7.3	Vaccine conveniently available	17	0.6	
7.4	Belief/confidence in immunization	22	0.8	
7.5	Pregnant	15	0.5	
7.6	Travel	10	0.4	
9.0	Uncodeable Reasons	10	0.4	2.5
12.0	Pandemic/epidemic nature of H1N1	34	1.2	1.2
12.1	H1N1 more sever, different from s.influenza	82	2.9	
12.3	Media related motivators encouragement	11	0.4	4.5
10.0	Reasons not provided	93	3.3	
	Total	2856	*100*	

Note: the proportions and counts within and between tables may not add up because of rounding errors, and because missing values and codes with 0 proportions were excluded from the final tables

pH1N1 Motivators (TOP, secondary reasons)

Code		Frequency	Proportion	Proportion per Theme
1.0	Prevent influenza in self	113	4.0	
1.1	Personal health issues	55	1.9	
1.2	Minimize influenza symptoms	13	0.5	
1.3	Self health	91	3.2	
1.4	Self protection/safety	153	5.4	
1.5	Fearful of infection	32	1.1	
1.7	Self: GENERAL STATEMENT	28	1.0	
1.8	Self: COMPOUNDED STATEMENT	17	0.6	
1.9	Reduce risk of infection	24	0.8	18.5
2.0	Prevent influenza friends and family	39	1.4	
2.1	Friends/family member health issues	21	0.7	
2.2	Family members: specific	61	2.1	
2.3	Friends/family member health	78	2.7	
2.4	Friends/family member protection	363	12.7	
2.5	Fearful for friends/family member influenza	13	0.5	
2.6	Prevent spread to Friends/family member	199	7.0	
2.7	Friends/family member: GENERAL STATEMENT	103	3.6	
2.8	Friends/family member: COMPOUNDED STATEMENT	9	0.3	
2.9	Friends/family member encouragement	10	0.4	31.4
3.1	Working with at risk patients	22	0.8	
3.3	Patient Health	18	0.6	
3.4	Patient protection/safety	131	4.6	
3.6	Prevent spread to patients	59	2.1	
3.7	Patients: GENERAL STATEMENT	34	1.2	
3.8	Patients: COMPOUNDED STATEMENT	17	0.6	9.9
4.3	Colleagues health	3	0.1	
4.4	Colleagues protection/safety	10	0.4	
4.6	Prevent spread to colleagues	4	0.1	
4.7	Colleagues: GENERAL STATEMENT	11	0.4	
4.8	Colleagues: COMPOUNDED STATEMENT	7	0.2	
4.9	Colleague encouragement	29	1.0	2.2
5.1	Protecting individuals at risk	3	0.1	
5.2	Herd immunity: SPECIFIC	5	0.2	

5.3	Other individual's health	8	0.3	
5.4	Other individual's protection/safety	41	1.4	
5.6	Prevent spread to other individuals	286	10.0	
5.8	Other individuals: COMPOUNDED STATEMENT	3	0.1	
5.9	Public pressure/motivation	5	0.2	12.3
6.1	HCW status implicates vaccination	7	0.2	
6.2	HCW at increased occupational risk	39	1.4	
6.3	Absenteeism	44	1.5	
6.4	Financial factors	16	0.6	
6.5	HCW vaccination compulsory, workplace policy	32	1.1	
6.6	To be a Role Model to other HCW	5	0.2	
6.7	HCW/Work: GENERAL STATEMENTS	81	2.8	7.8
7.2	Physician recommended vaccination	12	0.4	
7.3	Vaccine conveniently available	30	1.1	
7.4	Belief/confidence in immunization	8	0.3	
7.5	Pregnant	3	0.1	
7.6	Travel	9	0.3	2.2
9.0	Uncodeable Reasons	19	0.7	0.7
12.0	Pandemic/epidemic nature of H1N1	15	0.5	
12.1	H1N1 more sever, different from s.influenza	66	2.3	
12.3	Media related motivators encouragement	16	0.6	3.5
10.0	Reasons not provided	392	11.5	11.5
	Total	2856	*100*	

Note: the proportions and counts within and between tables may not add up because of rounding errors, and because missing values and codes with 0 proportions were excluded from the final tables

pH1N1 Motivators (TOP, tertiary reasons)

Code		Frequency	Proportion	Proportion per Theme
1.0	Prevent influenza in self	84	2.9	
1.1	Personal health issues	31	1.1	
1.2	Minimize influenza symptoms	16	0.6	
1.3	Self health	59	2.1	
1.4	Self protection/safety	118	4.1	
1.5	Fearful of infection	38	1.3	
1.7	Self: GENERAL STATEMENT	41	1.4	
1.8	Self: COMPOUNDED STATEMENT	10	0.4	
1.9	Reduce risk of infection	9	0.3	14.2
2.0	Prevent influenza friends and family	10	0.4	
2.1	Friends/family member health issues	11	0.4	
2.2	Family members: specific	26	0.9	
2.3	Friends/family member health	15	0.5	
2.4	Friends/family member protection	108	3.8	
2.5	Fearful for friends/family member influenza	2	0.1	
2.6	Prevent spread to Friends/family member	65	2.3	
2.7	Friends/family member: GENERAL STATEMENT	34	1.2	
2.8	Friends/family member: COMPOUNDED STATEMENT	23	0.8	
2.9	Friends/family member encouragement	6	0.2	10.5
3.0	Prevent influenza in patients	20	0.7	
3.1	Working with at risk patients	7	0.2	

3.3	Patient Health	30	1.1	
3.4	Patient protection/safety	229	8.0	
3.5	Fearful for patient influenza	4	0.1	
3.6	Prevent spread to patients	79	2.8	
3.7	Patients: GENERAL STATEMENT	60	2.1	
3.8	Patients: COMPOUNDED STATEMENT	54	1.9	16.9
4.3	Colleagues health	6	0.2	
4.4	Colleagues protection/safety	22	0.8	
4.6	Prevent spread to colleagues	8	0.3	
4.7	Colleagues: GENERAL STATEMENT	18	0.6	
4.8	Colleagues: COMPOUNDED STATEMENT	24	0.8	
4.9	Colleague encouragement	25	0.9	3.6
5.0	Prevent influenza in community (other individuals)	14	0.5	
5.2	Herd immunity: SPECIFIC	8	0.3	
5.3	Other individual's health	14	0.5	
5.4	Other individual's protection/safety	47	1.6	
5.6	Prevent spread to other individuals	192	6.7	
5.7	Other individuals: GENERAL STATEMENTS	11	0.4	
5.9	Public pressure/motivation	15	0.5	
6.1	HCW status implicates vaccination	16	0.6	10.5
6.2	HCW at increased occupational risk	33	1.2	
6.3	Absenteeism	97	3.4	
6.4	Financial factors	20	0.7	
6.5	HCW vaccination compulsory, workplace policy	61	2.1	
6.6	To be a Role Model to other HCW	18	0.6	
6.7	HCW/Work: GENERAL STATEMENTS	82	2.9	11.4
7.2	Physician recommended vaccination	15	0.5	
7.3	Vaccine conveniently available	65	2.3	
7.4	Belief/confidence in immunization	27	0.9	
7.5	Pregnant	2	0.1	
7.6	Travel	3	0.1	3.9
9.0	Uncodeable Reasons	33	1.2	1.2
12.0	Pandemic/epidemic nature of H1N1	22	0.8	
12.1	H1N1 more sever, different from s.influenza	24	0.8	
12.3	Media related motivators encouragement	28	1.0	2.8
10.0	Reasons not provided	712	24.9	24.9
	Total	2856	100.0	

Note: the proportions and counts within and between tables may not add up because of rounding errors, and because missing values and codes with 0 proportions were excluded from the final tables

pH1N1 Barriers (Overall)

Code		Frequency	Proportion	Proportion per Theme
1.0	Vaccination is not important necessary	37	2.9	
1.1	Personally of sound health	100	7.9	
1.2	Do not get sick or become infected with influenza	17	1.3	
1.3	Not fearful or scared	16	1.3	
1.4	Report SE to previous influenza vaccination	47	3.7	
1.6	Personal choice/belief	89	7.0	
1.7	Afraid of Needles	12	0.9	

1.8	Report previous H1N1 infection	25	2.0	
1.9	Confident in alternative methods	20	1.6	28.6
2.1	Vaccine safety issues	58	4.6	
2.2	Vaccine efficacy issues	30	2.4	
2.3	R&D limitations	182	14.4	
2.4	Possible side-effects	58	4.6	
2.5	Fearful of the vaccine	14	1.1	
2.6	Vaccine causes sickness	22	1.7	28.7
3.1	Time and schedule related barriers	38	3.0	
3.2	HCW status not an issue	35	2.8	
3.3	Pandemic misrepresented by external sources	46	3.6	
3.4	Do not become immunized for influenza	5	0.4	
3.5	Medical reasons for refusing the vaccine	18	1.4	11.2
9.0	Reasons that could not be coded	21	1.7	1.7
10.0	No reasons provided	378	29.8	29.8
	Total	1268	100.0	

Note: the proportions and counts within and between tables may not add up because of rounding errors, and because missing values and codes with 0 proportions were excluded from the final tables

pH1N1 Barriers (TOP, primary reasons)

Code		Frequency	Proportion	Proportion per Theme
1.0	Vaccination is not important necessary	26	6.1	
1.1	Personally of sound health	38	9.0	
1.2	Do not get sick or become infected with influenza	6	1.4	
1.3	Not fearful or scared	3	0.7	
1.4	Report SE to previous influenza vaccination	29	6.8	
1.6	Personal choice/belief	50	11.8	
1.7	Afraid of Needles	2	0.5	
1.8	Report previous H1N1 infection	17	4.0	
1.9	Confident in alternative methods	2	0.5	40.8
2.1	Vaccine safety issues	27	6.4	
2.2	Vaccine efficacy issues	9	2.1	
2.3	R&D limitations	82	19.3	
2.4	Possible side-effects	37	8.7	
2.5	Fearful of the vaccine	6	1.4	
2.6	Vaccine causes sickness	11	2.6	40.6
3.1	Time and schedule related barriers	12	2.8	
3.2	HCW status not an issue	11	2.6	
3.3	Pandemic misrepresented by external sources	10	2.4	
3.4	Do not become immunized for influenza	3	0.7	
3.5	Medical reasons for refusing the vaccine	7	1.7	10.1
9.0	Reasons that could not be coded	3	.7	0.7
10.0	No reasons provided	33	7.8	7.8
	Total	424	100.0	

Note: the proportions and counts within and between tables may not add up because of rounding errors, and because missing values and codes with 0 proportions were excluded from the final tables

pH1N1 Barriers (TOP, secondary reasons)

Code		Frequency	Proportion	Proportion per Theme
1.0	Vaccination is not important necessary	7	1.7	
1.1	Personally of sound health	37	8.8	
1.2	Do not get sick or become infected with influenza	9	2.1	
1.3	Not fearful or scared	8	1.9	
1.4	Report SE to previous influenza vaccination	15	3.6	
1.6	Personal choice/belief	17	4.0	
1.7	Afraid of Needles	3	0.7	
1.8	Report previous H1N1 infection	6	1.4	
1.9	Confident in alternative methods	4	0.9	25.1
2.1	Vaccine safety issues	18	4.3	
2.2	Vaccine efficacy issues	10	2.4	
2.3	R&D limitations	72	17.1	
2.4	Possible side-effects	14	3.3	
2.5	Fearful of the vaccine	6	1.4	
2.6	Vaccine causes sickness	6	1.4	29.9
3.1	Time and schedule related barriers	10	2.4	
3.2	HCW status not an issue	13	3.1	
3.3	Pandemic misrepresented by external sources	17	4.0	
3.4	Do not become immunized for influenza	2	0.5	
3.5	Medical reasons for refusing the vaccine	5	1.2	11.1
9.0	Reasons that could not be coded	11	2.6	2.6
10.0	No reasons provided	132	31.3	31.1
	Total	422	100.0	

Note: the proportions and counts within and between tables may not add up because of rounding errors, and because missing values and codes with 0 proportions were excluded from the final tables

pH1N1 Barriers (TOP, tertiary reasons)

Code		Frequency	Proportion	Proportion per Theme
1.0	Vaccination is not important necessary	4	0.9	
1.1	Personally of sound health	25	5.9	
1.2	Do not get sick or become infected with influenza	2	0.5	
1.3	Not fearful or scared	5	1.2	
1.4	Report SE to previous influenza vaccination	3	0.7	
1.6	Personal choice/belief	22	5.2	
1.7	Afraid of Needles	7	1.7	
1.8	Report previous H1N1 infection	2	0.5	
1.9	Confident in alternative methods	14	3.3	19.9
2.1	Vaccine safety issues	13	3.1	
2.2	Vaccine efficacy issues	11	2.6	
2.3	R&D limitations	28	6.6	
2.4	Possible side-effects	7	1.7	
2.5	Fearful of the vaccine	2	0.5	
2.6	Vaccine causes sickness	5	1.2	15.6
3.1	Time and schedule related barriers	16	3.8	

3.2	HCW status not an issue	11	2.6	
3.3	Pandemic misrepresented by external sources	19	4.5	
3.5	Medical reasons for refusing the vaccine	6	1.4	12.3
9.0	Reasons that could not be coded	7	1.7	1.7
10.0	No reasons provided	213	50.5	50.5
	Total	422	100.0	

Note: the proportions and counts within and between tables may not add up because of rounding errors, and because missing values and codes with 0 proportions were excluded from the final tables

sINFLU Motivators (overall)

Code		Frequency	Proportion	Proportion per Theme
1.0	Prevent influenza in self	712	9.8	
1.1	Personal health issues	119	1.6	
1.2	Minimize influenza symptoms	59	.8	
1.3	Self health	396	5.5	
1.4	Self protection/safety	535	7.4	
1.5	Fearful of infection	19	0.3	
1.7	Self: GENERAL STATEMENT	64	0.9	
1.8	Self: COMPOUNDED STATEMENT	57	0.8	
1.9	Reduce risk of infection	81	1.1	28.1
2.0	Prevent influenza friends and family	56	0.8	
2.1	Friends/family member health issues	51	0.7	
2.2	Family members: specific	111	1.5	
2.3	Friends/family member health	96	1.3	
2.4	Friends/family member protection	503	6.9	
2.6	Prevent spread to Friends/family member	241	3.3	
2.7	Friends/family member: GENERAL STATEMENT	169	2.3	
2.8	Friends/family member: COMPOUNDED STATEMENT	37	0.5	
2.9	Friends/family member encouragement	15	0.2	17.6
3.0	Prevent influenza in patients	16	0.2	
3.1	Working with at risk patients	52	0.7	
3.3	Patient health	46	0.6	
3.4	Patient protection/safety	350	4.8	
3.5	Fearful of patients becoming infected with influenza	2		
3.6	Prevent spread to patients	140	1.9	
3.7	Patients: GENERAL STATEMENT	87	1.2	
3.8	Patients: COMPOUNDED STATEMENT	84	1.2	10.7
4.0	Prevent influenza in colleagues	3		
4.3	Colleagues health	7	0.1	
4.4	Colleagues protection/safety	29	0.4	
4.6	Prevent spread to colleagues	11	0.2	
4.7	Colleagues: GENERAL STATEMENT	19	0.3	
4.8	Colleagues: COMPOUNDED STATEMENT	39	0.5	
4.9	Colleague encouragement	67	0.9	2.4
5.0	Prevent influenza in community (other individuals)	10	0.1	
5.2	Herd immunity: SPECIFIC	17	0.2	
5.3	Other individual's health	14	0.2	
5.4	Other individual's protection/safety	83	1.1	
5.6	Prevent spread to other individuals	463	6.4	
5.7	Other individuals: GENERAL STATEMENTS	9	0.1	
5.8	Other individuals: COMPOUNDED STATEMENT	3		
5.9	Public pressure/motivation	16	0.2	8.5
6.1	HCW status implicates vaccination	18	0.2	
6.2	HCW at increased occupational risk	59	0.8	
6.3	Absenteeism	152	2.1	

6.4	Financial factors	58	0.8	
6.5	HCW vaccination compulsory, workplace policy	242	3.3	
6.6	To be a Role Model to other HCW	33	0.5	
6.7	HCW/Work: GENERAL STATEMENTS	233	3.2	11.0
7.1	Out of Habit	34	0.5	
7.2	Physician recommended vaccination	41	0.6	
7.3	Vaccine conveniently available	40	0.6	
7.4	Belief/confidence in immunization	45	0.6	
7.5	Pregnant	13	0.2	
7.6	Travel	6	0.1	
7.7	Public health authority motivations	3		3.6
9.0	Uncodeable reasons	98	1.4	1.4
10.0	Reasons not provided	1213	16.7	16.7
	Total	7259	100.00	

Note: the proportions and counts within and between tables may not add up because of rounding errors, and because missing values and codes with 0 proportions were excluded from the final tables

sINFLU Motivators (TOP, primary reasons)

Code		Frequency	Proportion	Proportion per Theme
1.0	Prevent influenza in self	530	21.9	
1.1	Personal health issues	77	3.2	
1.2	Minimize influenza symptoms	17	0.7	
1.3	Self health	273	11.3	
1.4	Self protection/safety	329	13.6	
1.5	Fearful of infection	10	0.4	
1.7	Self: GENERAL STATEMENT	21	0.9	
1.8	Self: COMPOUNDED STATEMENT	19	0.8	
1.9	Reduce risk of infection	51	2.1	54.8
2.0	Prevent influenza friends and family	5	0.2	
2.1	Friends/family member health issues	27	1.1	
2.2	Family members: specific	56	2.3	
2.3	Friends/family member health	7	0.3	
2.4	Friends/family member protection	108	4.5	
2.6	Prevent spread to Friends/family member	45	1.9	
2.7	Friends/family member: GENERAL STATEMENT	47	1.9	
2.8	Friends/family member: COMPOUNDED STATEMENT	3	0.1	
2.9	Friends/family member encouragement	4	0.2	12.5
3.1	Working with at risk patients	19	0.8	
3.3	Patient health	4	0.2	
3.4	Patient protection/safety	82	3.4	
3.6	Prevent spread to patients	31	1.3	
3.7	Patients: GENERAL STATEMENT	16	0.7	
3.8	Patients: COMPOUNDED STATEMENT	13	0.5	6.9
4.4	Colleagues protection/safety	2	0.1	
4.8	Colleagues: COMPOUNDED STATEMENT	5	0.2	
4.9	Colleague encouragement	27	1.1	1.4
5.2	Herd immunity: SPECIFIC	5	0.2	
5.4	Other individual's protection/safety	9	0.4	
5.6	Prevent spread to other individuals	85	3.5	
5.9	Public pressure/motivation	6	0.2	4.3

6.1	HCW status implicates vaccination	5	0.2	
6.2	HCW at increased occupational risk	22	0.9	
6.3	Absenteeism	20	0.8	
6.4	Financial factors	17	0.7	
6.5	HCW vaccination compulsory, workplace policy	132	5.5	
6.6	To be a Role Model to other HCW	7	0.3	
6.7	HCW/Work: GENERAL STATEMENTS	84	3.5	11.9
7.1	Out of Habit	14	0.6	
7.2	Physician recommended vaccination	14	0.6	
7.3	Vaccine conveniently available	24	1.0	
7.4	Belief/confidence in immunization	14	0.6	
7.5	Pregnant	6	0.2	3.1
9.0	Uncodeable reasons	27	1.1	1.1
10.0	Reasons not provided	96	4.0	4.0
	Total	2421	100	

Note: the proportions and counts within and between tables may not add up because of rounding errors, and because missing values and codes with 0 proportions were excluded from the final tables

sINFLU Motivators (TOP, secondary reasons)

Code		Frequency	Proportion	Proportion per Theme
1.0	Prevent influenza in self	102	4.2	
1.1	Personal health issues	28	1.2	
1.2	Minimize influenza symptoms	26	1.1	
1.3	Self health	73	3.0	
1.4	Self protection/safety	119	4.9	
1.5	Fearful of infection	6	0.2	
1.7	Self: GENERAL STATEMENT	18	0.7	
1.8	Self: COMPOUNDED STATEMENT	23	1.0	
1.9	Reduce risk of infection	23	1.0	17.3
2.0	Prevent influenza friends and family	39	1.6	
2.1	Friends/family member health issues	15	0.6	
2.2	Family members: specific	39	1.6	
2.3	Friends/family member health	76	3.1	
2.4	Friends/family member protection	298	12.3	
2.6	Prevent spread to Friends/family member	145	6.0	
2.7	Friends/family member: GENERAL STATEMENT	99	4.1	
2.8	Friends/family member: COMPOUNDED STATEMENT	24	1.0	
2.9	Friends/family member encouragement	7	0.3	30.6
3.0	Prevent influenza in patients	2	0.1	
3.1	Working with at risk patients	23	1.0	
3.3	Patient health	12	0.5	
3.4	Patient protection/safety	97	4.0	
3.6	Prevent spread to patients	48	2.0	
3.7	Patients: GENERAL STATEMENT	17	0.7	
3.8	Patients: COMPOUNDED STATEMENT	24	1.0	9.2
4.3	Colleagues health	3	0.1	
4.4	Colleagues protection/safety	6	0.2	
4.6	Prevent spread to colleagues	3	0.1	
4.7	Colleagues: GENERAL STATEMENT	6	0.2	
4.8	Colleagues: COMPOUNDED STATEMENT	7	0.3	

4.9	Colleague encouragement	23	1.0	2.1
5.2	Herd immunity: SPECIFIC	7	0.3	
5.3	Other individual's health	4	0.2	
5.4	Other individual's protection/safety	35	1.4	
5.6	Prevent spread to other individuals	234	9.7	
5.8	Other individuals: COMPOUNDED STATEMENT	2	0.1	
5.9	Public pressure/motivation	3	0.1	11.9
6.1	HCW status implicates vaccination	4	0.2	
6.2	HCW at increased occupational risk	16	0.7	
6.3	Absenteeism	47	1.9	
6.4	Financial factors	28	1.2	
6.5	HCW vaccination compulsory, workplace policy	50	2.1	
6.6	To be a Role Model to other HCW	3	0.1	
6.7	HCW/Work: GENERAL STATEMENTS	66	2.7	8.8
7.1	Out of Habit	12	0.5	
7.2	Physician recommended vaccination	13	0.5	
7.3	Vaccine conveniently available	36	1.5	
7.4	Belief/confidence in immunization	7	0.3	
7.5	Pregnant	5	0.2	3.1
9.0	Uncodeable reasons	31	1.3	1.3
10.0	Reasons not provided	381	15.7	15.7
	Total	2421	100.0	

Note: the proportions and counts within and between tables may not add up because of rounding errors, and because missing values and codes with 0 proportions were excluded from the final tables

sINFLU Motivators (TOP, Tertiary reasons)

Code		Frequency	Proportion	Proportion per Theme
1.0	Prevent influenza in self	80	3.3	
1.1	Personal health issues	14	0.6	
1.2	Minimize influenza symptoms	16	0.7	
1.3	Self health	50	2.1	
1.4	Self protection/safety	87	3.6	
1.5	Fearful of infection	3	0.1	
1.7	Self: GENERAL STATEMENT	25	1.0	
1.8	Self: COMPOUNDED STATEMENT	15	0.6	
1.9	Reduce risk of infection	7	0.3	12.3
2.0	Prevent influenza friends and family	12	0.5	
2.1	Friends/family member health issues	9	0.4	
2.2	Family members: specific	16	0.7	
2.3	Friends/family member health	13	0.5	
2.4	Friends/family member protection	97	4.0	
2.6	Prevent spread to Friends/family member	51	2.1	
2.7	Friends/family member: GENERAL STATEMENT	23	1.0	
2.8	Friends/family member: COMPOUNDED STATEMENT	10	0.4	
2.9	Friends/family member encouragement	4	0.2	9.7
3.0	Prevent influenza in patients	13	0.5	
3.1	Working with at risk patients	10	0.4	
3.3	Patient health	30	1.2	
3.4	Patient protection/safety	171	7.1	

3.6	Prevent spread to patients	61	2.5	
3.7	Patients: GENERAL STATEMENT	54	2.2	
3.8	Patients: COMPOUNDED STATEMENT	47	1.9	16.0
4.0	Prevent influenza in colleagues	2	0.1	
4.3	Colleagues health	4	0.2	
4.4	Colleagues protection/safety	21	0.9	
4.6	Prevent spread to colleagues	7	0.3	
4.7	Colleagues: GENERAL STATEMENT	13	0.5	
4.8	Colleagues: COMPOUNDED STATEMENT	27	1.1	
4.9	Colleague encouragement	17	0.7	3.8
5.0	Prevent influenza in community (other individuals)	9	0.4	
5.2	Herd immunity: SPECIFIC	5	0.2	
5.3	Other individual's health	10	0.4	
5.4	Other individual's protection/safety	39	1.6	
5.6	Prevent spread to other individuals	144	5.9	
5.7	Other individuals: GENERAL STATEMENTS	8	0.3	
5.9	Public pressure/motivation	7	0.3	9.3
6.1	HCW status implicates vaccination	9	0.4	
6.2	HCW at increased occupational risk	21	0.9	
6.3	Absenteeism	85	3.5	
6.4	Financial factors	13	0.5	
6.5	HCW vaccination compulsory, workplace policy	60	2.5	
6.6	To be a Role Model to other HCW	23	1.0	
6.7	HCW/Work: GENERAL STATEMENTS	83	3.4	
7.1	Out of Habit	8	0.3	12.1
7.2	Physician recommended vaccination	14	0.6	
7.3	Vaccine conveniently available	59	2.4	
7.4	Belief/confidence in immunization	24	1.0	
7.5	Pregnant	2	0.1	
7.6	Travel	4	0.2	4.7
7.7	Public health authority motivations	3	0.1	
9.0	Uncodeable reasons	40	1.7	1.7
10.0	Reasons not provided	740	30.6	30.6
	Total	2421	100.0	

Note: the proportions and counts within and between tables may not add up because of rounding errors, and because missing values and codes with 0 proportions were excluded from the final tables

sINFLU Barriers (Overall)

Code		Frequency	Proportion	Proportion per Theme
1.0	Vaccination is not important necessary	151	5.9	
1.1	Personally of sound health	183	7.1	
1.2	Do not get sick or become infected with influenza	129	5.0	
1.3	Not fearful or scared	67	2.6	
1.4	Report SE to previous influenza vaccination	52	2.0	
1.6	Personal choice/belief	79	3.1	
1.7	Afraid of Needles	30	1.2	
1.8	Report previous H1N1 infection	4	0.2	
1.9	Confident in alternative methods	37	1.4	28.4
2.1	Vaccine safety issues	83	3.2	
2.2	Vaccine efficacy issues	171	6.6	

2.3	R&D limitations	27	1.0	
2.4	Possible side-effects	126	4.9	
2.5	Fearful of the vaccine	12	0.5	
2.6	Vaccine causes sickness	97	3.8	20.0
3.1	Time and schedule related barriers	98	3.8	
3.2	HCW status not an issue	79	3.1	
3.4	Do not become immunized for influenza	30	1.2	
3.5	Medical reasons for refusing the vaccine	25	1.0	10.0
9.0	Reasons that could not be coded	42	1.6	1.6
10.0	No reasons provided	1032	40.0	40.0
	Total	2580	100.0	

Note: the proportions and counts within and between tables may not add up because of rounding errors, and because missing values and codes with 0 proportions were excluded from the final tables

sINFLU Barriers (TOP, primary reasons)

Code		Frequency	Proportion	Proportion per Theme
1.0	Vaccination is not important necessary	103	12.0	
1.1	Personally of sound health	69	8.0	
1.2	Do not get sick or become infected with influenza	66	7.7	
1.3	Not fearful or scared	22	2.6	
1.4	Report SE to previous influenza vaccination	36	4.2	
1.6	Personal choice/belief	42	4.9	
1.7	Afraid of Needles	13	1.5	
1.8	Report previous H1N1 infection	4	0.5	
1.9	Confident in alternative methods	4	0.5	41.8
2.1	Vaccine safety issues	44	5.1	
2.2	Vaccine efficacy issues	92	10.7	
2.3	R&D limitations	12	1.4	
2.4	Possible side-effects	67	7.8	
2.5	Fearful of the vaccine	5	0.6	
2.6	Vaccine causes sickness	46	5.3	30.9
3.1	Time and schedule related barriers	46	5.3	
3.2	HCW status not an issue	36	4.2	
3.3	Pandemic misrepresented by external sources	3	0.3	
3.4	Do not become immunized for influenza	18	2.1	
3.5	Medical reasons for refusing the vaccine	13	1.5	13.5
9.0	Reasons that could not be coded	14	1.6	1.6
10.0	No reasons provided	105	12.2	12.2
	Total	861	100.0	100

Note: the proportions and counts within and between tables may not add up because of rounding errors, and because missing values and codes with 0 proportions were excluded from the final tables

sINFLU Barriers (TOP, secondary reasons)

Code		Frequency	Proportion	Proportion per Theme
1.0	Vaccination is not important necessary	29	3.4	
1.1	Personally of sound health	75	8.7	
1.2	Do not get sick or become infected with influenza	36	4.2	
1.3	Not fearful or scared	26	3.0	
1.4	Report SE to previous influenza vaccination	13	1.5	
1.6	Personal choice/belief	26	3.0	
1.7	Afraid of Needles	10	1.2	
1.9	Confident in alternative methods	19	2.2	27.2
2.1	Vaccine safety issues	27	3.1	
2.2	Vaccine efficacy issues	52	6.0	
2.3	R&D limitations	7	0.8	
2.4	Possible side-effects	30	3.5	
2.5	Fearful of the vaccine	6	0.7	
2.6	Vaccine causes sickness	33	3.8	18.0
3.1	Time and schedule related barriers	27	3.1	
3.2	HCW status not an issue	24	2.8	
3.4	Do not become immunized for influenza	12	1.4	
3.5	Medical reasons for refusing the vaccine	8	0.9	9.4
9.0	Reasons that could not be coded	18	2.1	
10.0	No reasons provided	372	43.2	
	Total	861	100.0	

Note: the proportions and counts within and between tables may not add up because of rounding errors, and because missing values and codes with 0 proportions were excluded from the final tables

sINFLU Barriers (TOP, tertiary reasons)

Code		Frequency	Proportion	Proportion per Theme
1.0	Vaccination is not important necessary	19	2.2	
1.1	Personally of sound health	39	4.5	
1.2	Do not get sick or become infected with influenza	27	3.1	
1.3	Not fearful or scared	19	2.2	
1.4	Report SE to previous influenza vaccination	3	.3	
1.6	Personal choice/belief	11	1.3	
1.7	Afraid of Needles	7	.8	
1.9	Confident in alternative methods	14	1.6	16.1
2.1	Vaccine safety issues	12	1.4	
2.2	Vaccine efficacy issues	27	3.1	
2.3	R&D limitations	8	.9	
2.4	Possible side-effects	29	3.4	
2.5	Fearful of the vaccine	1	.1	
2.6	Vaccine causes sickness	18	2.1	11.1
3.1	Time and schedule related barriers	25	2.9	
3.2	HCW status not an issue	19	2.2	
3.5	Medical reasons for refusing the vaccine	4	.5	7.0
9.0	Reasons that could not be coded	10	1.2	1.2
10.0	No reasons provided	555	64.5	64.5
	Total	858	100.0	

Note: the proportions and counts within and between tables may not add up because of rounding errors, and because missing values and codes with 0 proportions were excluded from the final tables

Appendix – Section D1

Logistic Regression Model legend (These models were generated to investigate associations between occupational class and formal religious beliefs and pH1N1 vaccination)

Excludes H1N1 Attitude and Knowledge Scale items

Model 1: All variables that were SS* in the univariate analysis (i.e. Base model, included in Table 5.4)

Model 2: Variables that were SS* in the univariate analysis, excludes formal religious beliefs

Includes HBM based H1N1 Attitude and Knowledge Scale items

Model 3: Variables that were SS* in univariate analysis (i.e. Base Model + Attitudes Scale Items, included in Table 5.4)

Model 4: Variables that were SS* in univariate analysis, excludes formal religious beliefs

Model 5: Variables that were SS* in univariate analysis, excludes Occupation

Model 6: Variables that were SS* in univariate analysis, excludes religious beliefs and Occupation

SS*- Statistically significant at 0.10 level

Multivariate regression analysis, modelling factors predictive of Health Care Worker pH1N1 vaccination

Predictor Variables	Model 2		Model 4	
	OR	95% CI	OR	95% CI
Sociodemographics				
In a relationship	1.45	(1.01, 2.06)	-	-
Type of work: full-time	1.69	(1.21, 2.38)	1.92	(1.28, 2.88)
Occupation Classification				
Physician	1	Reference	1	Reference
Nursing	0.47	(0.14, 1.57)	0.89	(0.21, 3.85)
Allied HCW	0.69	(0.19, 2.51)	1.41	(0.30, 6.68)
Administrative/clerical	0.35	(0.10, 1.19)	0.58	(0.13, 2.53)
Healthcare technicians	0.71	(0.19, 2.66)	2.07	(0.42, 10.15)
Research and laboratory	0.60	(0.16, 2.22)	0.85	(0.18, 3.99)
Facilities and logistics	0.35	(0.09, 1.32)	1.26	(0.25, 6.33)
Other, non-clinical	0.17	(0.05, 0.66)	1.92	(1.27, 2.88)
Influenza Risk Populations				
Regular contact with children	1.46	(1.05, 2.01)	-	-
Family Member has a chronic illness	1.67	(1.11, 2.52)	-	-
Influenza Vaccine History				
Past side-effects to influenza vaccination	0.62	(0.44, 0.87)	-	-
Allergy to vaccine components	0.14	(0.06, 0.31)	0.05	(0.01, 0.12)
2008/09 Seasonal Influenza vaccination	3.32	(2.36, 4.66)	1.48	(0.96, 2.29)
2009/10 Seasonal Influenza vaccination	5.03	(3.29, 7.71)	3.16	(1.93, 5.16)
pH1N1 Vaccine Attitudes Scale Items				
I am at high personal risk for getting pH1N1	-	-	1.82	(1.09, 3.06)
It is very likely that I can infect patients with pH1N1 if I don't get the pH1N1 vaccine	-	-	1.82	(1.09,3.02)
The H1N1 vaccine IS required for a healthy person[R]	-	-	1.86	(1.21, 2.85)

H1N1 is dangerous for hospital patients, where I work	-	-	0.60	(0.37, 0.98)
The thought of getting H1N1 scares me	-	-	1.97	(1.27, 3.04)
If I get vaccinated against H1N1, then I will be more certain that I will not infect family members	-	-	2.74	(1.81, 4.15)
I believe the H1N1 vaccine is safe	-	-	2.50	(1.54, 4.06)
I have time to get the H1N1vaccine^{R}	-	-	1.82	(1.19, 2.79)
The H1N1 vaccine will NOT make me sick^{R}	-	-	1.65	(1.09, 2.51)
My doctor encouraged me to get the H1N1vaccine	-	-	2.63	(1.55, 4.48)
My supervisor thought it was a good idea for me to get the H1N1 vaccine	-	-	1.86	(1.24, 2.79)
All HCW should be vaccinated against H1N1	-	-	3.45	(2.10, 5.68)
Area under ROC	***0.83***	***(0.81, 0.87)***	***0.95***	***(0.93, 0.96)***

Multivariate regression analysis, modelling factors predictive of Health Care Worker pH1N1 vaccination

Predictor Variables	Model 5		Model 6	
	OR	95% CI	OR	95% CI
Sociodemographics				
Formal religious belief	1.95	(1.41, 2.73)	-	-
Type of work: full-time	2.05	(1.49, 2.83)	1.82	(1.23, 2.71)
Occupation Classification				
Physician	-	-	-	-
Nursing	-	-	-	-
Allied HCW	-	-	-	-
Administrative/clerical	-	-	-	-
Healthcare technicians	-	-	-	-
Research and laboratory	-	-	-	-
Facilities and logistics	-	-	-	-
Other, non-clinical	-	-	-	-
Influenza Risk Populations				
Regular contact with children	-	-	-	-
Family Member has a chronic illness	-	-	-	-
Influenza Vaccine History				
Past side-effects to influenza vaccination			-	-
Allergy to vaccine components	0.14	(0.05, 0.24)	0.04	(0.01, 0.12)
2008/09 Seasonal Influenza vaccination	1.58	(1.12, 2.25)	1.50	(0.99, 2.27)
2009/10 Seasonal Influenza vaccination	3.06	(1.97, 4.77)	3.21	(1.98, 5.21)
pH1N1 Vaccine Attitudes Scale Items				
I am at high personal risk for getting pH1N1	1.23	(0.81, 1.88)	1.88	(1.14, 3.10)
It is very likely that I can infect patients with pH1N1 if I don't get the pH1N1 vaccine	1.38	(0.91, 2.08)	1.84	(1.12, 3.04)
The H1N1 vaccine IS required for a healthy person^{R}	1.01	(0.70, 1.45)	1.68	(1.11, 2.54)

H1N1 is dangerous for hospital patients, where I work	-	-	-	-
The thought of getting H1N1 scares me	0.98	(0.60, 1.60)	1.72	(1.13, 2.62)
If I get vaccinated against H1N1, then I will be more certain that I will not infect family members	2.45	(1.71, 3.50)	2.59	(1.72, 3.88)
I believe the H1N1 vaccine is safe	2.23	(1.55, 3.20)	2.47	(1.54, 3.97)
I have time to get the H1N1vaccine^{R}	1.03	(0.71, 1.48)	1.86	(1.23, 2.82)
The H1N1 vaccine will NOT make me sick^{R}	1.35	(0.96, 1.90)	1.52	(1.01, 2.29)
People close to me (e.g. spouse, family, friends) think that it is important for me to get vaccinated against H1N1	1.39	(0.91, 2.14)	-	-
My doctor encouraged me to get the H1N1vaccine	0.99	(0.68, 1.46)	2.46	(1.47, 4.12)
My supervisor thought it was a good idea for me to get the H1N1 vaccine	1.68	(1.21, 2.33)	1.90	(1.29, 2.78)
All HCW should be vaccinated against H1N1	1.89	(1.23, 2.92)	3.11	(1.92, 5.02)
Area under ROC	***0.89***	***(0.87, 0.91)***	***0.94***	***(0.93, 0.96)***

Logistic Regression Model S. Influenza

Excludes H1N1 Attitude and Knowledge Scale items

Model 1: All variables that were SS* in the univariate analysis (i.e. Base model, included in Table 6.4)

Model 2: Variables that were SS in the univariate analysis, age dichotomized (<30 and >30)

Includes HBM based H1N1 Attitude and Knowledge Scale items

Model 3: Variables that were SS in univariate analysis (i.e. Base Model + Attitudes Scale Items, included in Table 6.4)

Model 4: Variables that were SS* in univariate analysis, age dichotomized (<30 and >30)

SS*- Statistically significant at 0.10 level

Multivariate regression analysis, modelling factors predictive of Health Care Worker sINFLU vaccination

Predictor Variables	**Model 2**		**Model 4**	
	OR	95% CI	OR	95% CI
Sociodemographics				
Age Dichotomized (age >30)	1.39	(1.06, 1.81)	-	-
Occupation Classification				
Physician	1	Reference	1	Reference
Nursing	0.95	(0.49, 1.86)	1.71	(0.80, 3.69)
Allied HCW	0.48	(0.24, 0.98)	0.89	(0.39, 2.01)
Administrative/clerical	0.62	(0.31, 1.22)	0.82	(0.38, 1.78)
Healthcare technicians	0.40	(0.19, 0.82)	0.68	(0.30, 1.57)
Research and laboratory	0.55	(0.26, 1.15)	0.68	(0.30, 1.57)
Facilities and logistics	0.38	(0.17, 0.82)	0.60	(0.25, 1.43)
Other, non-clinical	0.50	(0.21, 1.17)	0.57	(0.25, 1.43)
Influenza Risk Populations				
Regular contact with elderly	1.29	(1.02, 1.64)	1.34	(1.03, 1.74)
Personal chronic illness	1.57	(1.07, 2.30)	-	-
Influenza Vaccine History				
Past side-effects to influenza vaccination	0.77	(0.60, 1.00)	-	-
Allergy to vaccine components	0.96	(0.03, 0.26)	0.097	(0.03, 0.27)
pH1N1 Influenza vaccination	3.13	(2.22, 4.39)	-	-
2009/10 Seasonal Influenza vaccination	10.97	(8.32, 14.47)	5.68	(4.20, 7.67)
sINFLU Vaccine Attitudes Scale Items				
I am likely to get sINFLU if I don't get the sINFLU vaccine	-	-	1.41	(1.20, 1.65)
The sINFLU vaccine IS required for a healthy person^{R}	-	-	1.39	(1.19, 1.62)

I do not expect any allergic reactions after getting the sINFLU vaccine	-	-	1.21	(1.04, 1.40)
I am NOT worried about the side-effects of getting the sINFLU vaccine	-	-	1.48	(1.29, 1.70)
People close to me (e.g. spouse, family, friends) think that it is important for me to get vaccinated against sINFLU	-	-	1.29	(1.10, 1.52)
My doctor encouraged me to get the sINFLU vaccine	-	-	1.18	(1.00, 1.36)
All HCW should be vaccinated against sINFLU	-	-	1.44	(1.21, 1.71)
I believe in immunization^{R}	-	-	1.21	(1.04, 1.41)
Area under ROC	***0.84***	***(0.82, 0.86)***	***0.89***	***(0.88, 0.91)***