

**Acceptance of an emergently released vaccine by the general public:
2009 H1N1 influenza pandemic vaccine**

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ABSTRACT

The recent experience with the 2009 H1N1 pandemic has drawn attention to the need to better understand the public's response to emergently released vaccines(ERV). This study applied a mixed methods approach to examine the causal pathways underlying the vaccination behaviour during a public health emergency. The integrated evidence from empirical and theoretical-based findings highlights a number of factors to consider in interventions to improve vaccination rates with an ERV. These factors include: 1) providing clear risk messages around the disease and the ERV, 2) improving accessibility to the vaccine, 3) encouraging primary healthcare providers to provide recommendations for vaccination, 4) implementing strategies to increase seasonal influenza vaccination prior to the next public health emergency, 5) developing strategies to target sub-populations more reluctant to accept an ERV. Developing theory-based interventions that are behaviour-specific may be more likely to result in behaviour change within the public in future emergency vaccination campaigns.

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INTRODUCTION

Vaccination and its role in advancing public health

Vaccination was among the most cost-effective public health interventions of the 20th century and is estimated to prevent from 2 to 3 million deaths worldwide each year ¹. The widespread use of vaccines has resulted in the reduction of the global public health burden associated with infectious diseases that once threatened the health of people worldwide ².

Vaccines can result in dramatic reductions or even eradication of infectious diseases. In part, this is due to the establishment of herd immunity within a population from mass vaccination campaigns. If a large enough percentage of the population is vaccinated, the high level of immunity within the population exerts protection to the small percentage of individuals who are not vaccinated, and the spread of a disease can be prevented³.

Numerous infectious diseases have been successfully eradicated or contained through mass vaccination campaigns. For example, smallpox is one of the most devastating diseases in the history of humanity and epidemics of smallpox swept across the world for centuries killing every fourth victim and scarring or blinding most survivors⁴. Vaccination for smallpox in the 1950s and 1960s reduced the number of cases occurring each year around the world from 50 million to 15 million cases. After the launch of a global eradication campaign, smallpox was declared eradicated in 1977.

The introduction of the measles vaccine is another example of a successful international vaccination initiative. Measles is the leading cause of death among young children worldwide⁵. Before widespread vaccination in the 1980s, approximately 2.6 million people were killed by measles each year. Expanded measles vaccination targeting

high-risk countries decreased the number of measles related deaths by 78% between 2000 and 2008.

The global impact of other infectious diseases such as polio, diphtheria, tetanus, and pertussis has also been dramatically reduced following large-scale vaccination programs ^{6, 7}. Vaccination is also the most effective way to prevent infection and severe outcomes caused by influenza viruses ⁸, and seasonal influenza vaccination is the cornerstone of influenza prophylaxis in most countries around the world.

Vaccination is consistently ranked among the top public health achievements worldwide, contributing to the reduction of disease burden and improving the longevity of humanity ^{2, 9}. Furthermore, it is ranked among the best ways to advance global welfare ¹⁰ and continues to be a public health priority worldwide.

Approval process for publicly available vaccines

In Canada, publicly available vaccines undergo a stringent and continuous review process. Prior to being given market authorization, most publicly available vaccines have undergone numerous studies (pre-clinical and clinical trials involving human subjects) to establish safety and effectiveness ¹¹. As required by the Food and Drugs Act and Regulations¹², the manufacturer must then present a substantive amount of scientific evidence demonstrating a vaccine's safety, efficacy, and quality. The responsibility for the review process lies with Health Canada's Health Products and Food Branch ¹². The evaluation process for market authorization of a new drug submission can take up to one year to conduct¹¹. Once on the market, vaccines are continuously monitored for safety, efficacy, and quality through post-market surveillance and assessment by Health Canada. If health

risks and/or adverse reactions are identified, warnings are issued to the public and the product may be removed from the market.

Following market authorization, vaccines must undergo the Common Drug Review (CDR) in order to be publicly funded by participating federal, provincial, or territorial drug benefit plans¹³. This review is conducted by the CDR Directorate within the Canadian Agency for Drugs and Technologies in Health. A drug's cost-effectiveness is assessed based on evidence-based clinical and pharmaco-economic reviews and is forwarded to the Canadian Expert Drug Advisory Committee (CEDAC) for recommendations on formulary listing.

Despite the rigorous and continuous evaluation process for established publicly funded vaccines, some people are still hesitant to get vaccinated. The factors underlying the decision to vaccinate with established vaccines, such as paediatrics vaccines, have been well described in the literature. One review reported demographic factors, lack of knowledge about a disease or vaccination, fear of side effects, scepticism towards medical information, lack of support from healthcare provider, and accessibility as factors influencing a decline in uptake of paediatric vaccines¹⁴. A systematic review of qualitative studies examining barriers to paediatric vaccination revealed similar factors consistently identified by parents to be barriers to uptake: perceptions about vaccine safety and effectiveness, perceptions of threat posed by the pathogen, trust in public health officials endorsing the vaccine, vaccine availability, and accessibility to the vaccine¹⁵. Other barriers that may impede children's receipt of paediatric vaccines include: the alleged link between the MMR vaccine and autism¹⁶, beliefs that children receive too many vaccinations¹⁶, religious beliefs¹⁷, inconvenience of the vaccination process¹⁷, or lack of recommendations for vaccination from healthcare

providers¹⁸. In general, the rigorous approval processes that are required to make vaccines available to the public alone are not enough to ensure that everyone will get vaccinated.

Emergently released vaccines

The speed and ease of international travel and trade in the 21st century has greatly facilitated the transmission of emerging and re-emerging infectious diseases around the world. An increase in the emergence and spread of these pathogens internationally means outbreaks once considered to be a public health burden of less-developed countries are invading developed countries including Canada¹⁹. Worldwide, from 1940 to 2004 there has been an emergence of 335 infectious diseases in the human population²⁰. These diseases include: HIV/AIDS, Ebola, West Nile, Creutzfeldt-Jakob disease, Lyme disease, severe acute respiratory syndrome (SARS), H1N1 influenza, as well as re-emergence of tuberculosis, cholera, and malaria.

During an outbreak, the spread of an infectious disease can occur so rapidly within a population that public health authorities have little time to assess the outbreak and implement a response. Vaccines constitute an important primary prevention component of emergency response measures against infectious disease outbreaks. Given the urgent nature of an outbreak, a vaccine must be developed quickly, distributed rapidly and efficiently. Furthermore, a large portion of the population must be vaccinated within a short time period to maximize the benefits of a vaccine. We propose a new category of vaccines, emergently released vaccines (ERVs), which is different from established vaccines in a number of important ways, and that necessitates it being studied separately. An ERV can be defined as a novel vaccine that is developed quickly during a public health emergency. It must also be approved, distributed, and used by a large proportion of the public within a fixed time frame

to minimize the impact of an outbreak. H5N1 and H1N1 influenza vaccines are examples of vaccines that satisfy the proposed characteristics of an ERV.

During a public health emergency, vaccination decisions for individual members of the public may involve issues that are distinct from those relevant to established vaccines. The rapid development of a vaccine may lead some members of the general public to perceive a lack of sufficient evidence-based data for safety and effectiveness. The rapid approval process to make a vaccine promptly available during an emergency may be met with scepticism from members of the public as the process may be perceived to not be sufficiently rigorous. Furthermore, during a public health emergency there may be little concrete knowledge on the impact of the disease and vaccine, and information provided to the general public may change as new data becomes available. A lack of knowledge and conflicting data may cause individuals to question the necessity for mass vaccination. Understanding the factors that influence an individual's decision to be vaccinated with an ERV may inform the development of interventions to increase the vaccination rate within the general public in future public health emergencies.

H1N1 influenza A epidemiology

The 2009 H1N1 influenza A pandemic and vaccine provide a unique opportunity to explore the public's response to an ERV and to gain further understanding of the factors that influence individual decisions to accept or decline an ERV. In 2009, a unique strain of the influenza A virus that had not previously circulated in humans emerged: the H1N1 influenza A virus²¹. The H1N1 influenza outbreak was first detected as the cause of severe respiratory illnesses in Mexico in March 2009²². In June 2009, the World Health Organization declared

the outbreak to be the first pandemic in 41 years with 74 countries ultimately reporting laboratory-confirmed cases of pandemic H1N1²³.

The emergence of the H1N1 virus in humans caused widespread infection from person to person and across continents due to the lack of immunity to the virus in a large proportion of the world's population²⁴. The distinct difference between seasonal influenza infection and pandemic H1N1 influenza infection is in the pattern of illness and death. In contrast with seasonal influenza, people most frequently infected with H1N1, requiring hospitalization and intensive care, and dying from infection were younger people and/or people who were previously healthy²⁵.

The Public Health Agency of Canada confirmed the first Canadian case of H1N1 on April 26, 2009²². Canada experienced two waves of H1N1; the first was between April to August 2009. The second wave, with higher level in influenza activity, occurred from August 2009 to January 2010. The second wave resulted in five times more hospitalizations and deaths compared to the first wave. By the end of the second wave there were over 40,000 laboratory-confirmed Canadian cases of H1N1²². The burden of H1N1 infection on the healthcare system included: 8,678 hospitalized cases (highest in age group < 20 years); 1,473 admitted to the intensive care unit; and 428 deaths²⁶. The emergence of the H1N1 virus and its impact on the Canadian population emphasize the important role of vaccination as a primary prevention measure to reduce the spread of an outbreak and to minimize the burden of illness on the healthcare system.

Pandemic H1N1 influenza A vaccine

A pandemic vaccine was among the seven pillars of the Canadian Pandemic Influenza Plan²⁶. In preparation for potential pandemics, Health Canada started work with a

domestic manufacturer to identify safety data on the vaccine components of a ‘mock’ pandemic vaccine in 2005²². The H1N1 vaccine was developed based on this research data, enabling public health authorities to review and authorize the use of a safe and efficacious vaccine in the shortest time frame possible²². The Biologics and Genetic Therapies Directorate within Health Canada, the focal point for review and authorization of pandemic vaccines, planned for an expedited review process of the pandemic H1N1 vaccines (adjuvanted and unadjuvanted)²². The Directorate used a “rolling” submission approach, which allowed the data to be reviewed as it became available, with greater emphasis on post-market surveillance and evaluation compared to the standard review process.

In Canada, the Public Health Agency of Canada ordered approximately 50.4 million doses of the H1N1 vaccine, which was estimated to be enough “to immunize all Canadians who needed and wanted protection against the H1N1 influenza virus”²², or two doses for 75% of the population²⁷. Early in the pandemic, before the availability of the vaccine, approximately two-thirds of the Canadian population did not intend to get vaccinated with the H1N1 vaccine²⁸. Despite the implementation of mass vaccination campaigns across the country, the long line-ups for the vaccine, and the busy vaccination clinics, 60% of Canadians still opted not to get vaccinated²⁹. Thus, the small difference between the initial demand for the pandemic vaccine and the actual rate of uptake suggests that members of the general public were still reluctant to get vaccinated and further research is necessary to explore factors that influence people’s decision to vaccinate with an ERV in preparations for future public health emergencies.

To date, the focus of vaccination research has been on factors influencing the uptake of existing and established vaccines such as paediatric vaccines. Since the 2009 H1N1 pandemic, more research has been published on the predictors of the use of pandemic H1N1

vaccine. Some factors that have been reported to influence the decision about whether or not to vaccinate with the 2009 H1N1 vaccine included: perception of the threat posed by the emerging infectious disease, concerns about the expedited evaluation process to make the vaccine available to the public, recommendations from a healthcare provider, and safety and effectiveness of the vaccine^{30, 31}.

ERVs are distinctly different from established vaccines in a number of ways; hence the barriers to vaccination with an ERV may also be different from the barriers to vaccination with an established vaccine. The current lack of synthesized knowledge on barriers to vaccination during a public health emergency necessitates a summary of these barriers, as well as further exploration of these barriers to inform interventions aimed at maximizing the uptake of an ERV in a future public health emergency.

Knowledge Translation

The public's reluctance to be vaccinated with an ERV can be thought of as a problem in knowledge translation: delivering evidence-based information about the public health emergency and the vaccine between researchers and end-users. Knowledge translation (KT) is defined by the Canadian Institutes of Health Research (CIHR) as “a dynamic and iterative process that includes synthesis, dissemination, exchange, and ethically-sound application of knowledge to improve the health of Canadians, provide more effective health services and products, and strengthen the health care system”³². The KT process involves a two-way interaction between researchers and knowledge users that aims to ultimately result in transfer and uptake of evidence-based findings by the knowledge users, yet it is well known that implementing new knowledge into practice can be a challenge³³.

The Knowledge-to-Action (KTA) process defined by Graham and colleagues (Figure 1) describes the dynamic process in which evidence-based research findings should be transferred into everyday practice³³. Knowledge creation is conceptualized as an inverted funnel that represents the distillation of scientific studies down to actionable knowledge. Through this distillation process, a large amount of scientific evidence (the top of the inverted triangle) is synthesized into a small amount of key actionable knowledge. Knowledge tools are developed to present this actionable knowledge in a manner that will ultimately facilitate the uptake and application of the knowledge.

The boxes surrounding the inverted triangle in Figure 1 depict the action cycle portion of the KTA model that is based on various planned-action theories. The action cycle consists of seven phases that are involved in the application of knowledge to deliberately influence the behaviour of the knowledge users. In the first phase of the action cycle the problem is identified, research knowledge that might address the problem is appraised for validity and usefulness, and relevant evidence-based knowledge is selected. The next phase involves tailoring and adapting the selected knowledge to the local context of the knowledge users based on value, usefulness, and appropriateness of the knowledge. The uptake of knowledge by users may be impeded by barriers and eased by facilitators; in this next phase barriers and facilitators are identified to target in intervention strategies. The next phase is focused on dissemination of knowledge and involves selecting, tailoring, and implementing interventions to address the barriers and promote implementation of the knowledge. Monitoring knowledge use first requires defining knowledge use so that it can be measured and then determining whether the interventions have been sufficient in bringing about the desired degree of knowledge use, or whether more interventions are required. Next, the evaluation phase determines the impact of using the knowledge by evaluating whether

knowledge application has resulted in a change in the desired health-related outcomes.

Finally, the last phase involves assessing barriers that may impede the continuous use of the knowledge, and it feeds back into the action cycle to identify and address these barriers.

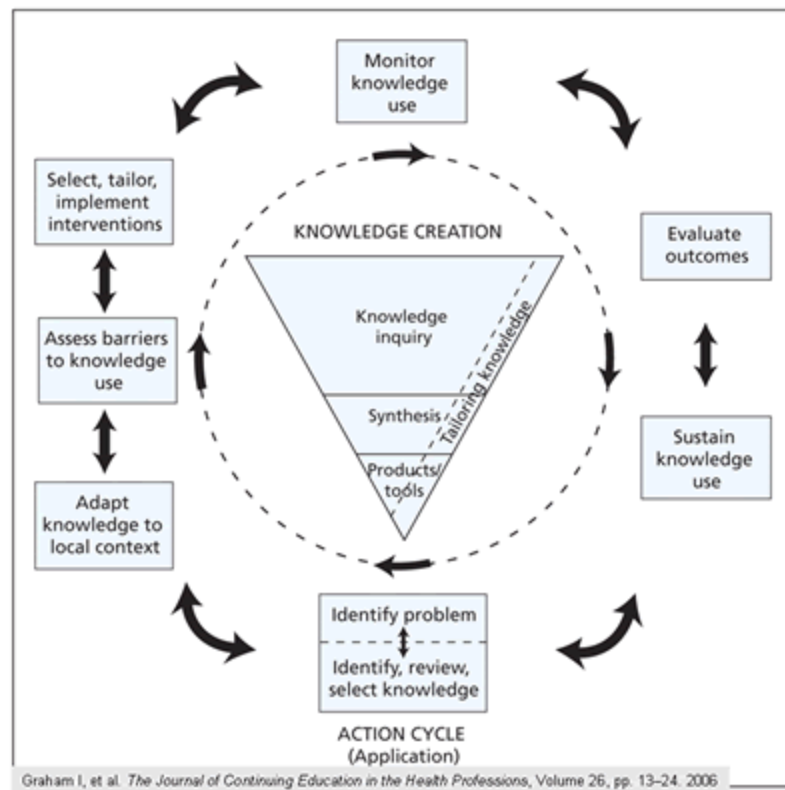


Figure 1. Knowledge-to-Action Cycle³³

Purpose of KT in behaviour change

The development of knowledge tools and products such as information pamphlets and guidelines (KTA knowledge creation) ultimately do not guarantee a change in the behaviour. Careful and deliberate development, implementation, and assessment of activities that may be needed for knowledge application, as depicted by the KTA action cycle, may lead to more effective uptake of knowledge by the end users. During the H1N1 pandemic,

dissemination of information products and widespread vaccination campaigns did not result in a large difference between the intention of members of the general public to get vaccinated and overall uptake of the vaccine by the Canadian general public. Influenza vaccination is voluntary in Canada, consequently the vaccination decision for the pandemic H1N1 vaccine relied on the individuals within the general public making individual decisions to go out and get vaccinated. Interventions aiming to increase the vaccination rate must be informed by evidence-based research on the factors that influence an individual's decision to vaccinate or not vaccinate.

KT research is moving towards using existing theoretical work to shed light on processes that underlie behaviour change. Such theories of behaviour propose causal pathways underlying behaviours and behaviour change; pathways that ultimately may be exploited to facilitate the desired behaviour³⁴. Eccles and colleagues have explored the role for behaviour theory in designing and implementing interventions aimed at changing behaviour to be more in line with evidence-based knowledge³⁵. They suggest that effective behaviour change interventions must be developed based on an understanding of theory-derived factors or psychological constructs that underlie a specific behaviour. These factors in turn are the targets for interventions aimed at changing the targeted behaviour. Research reviews have shown that use of theory to inform interventions increases the effectiveness of these interventions to change the targeted behaviour³⁶. Theories of behaviour have been used to explore healthcare professionals' behaviours such as understanding transfusion prescribing behaviour³⁷ and antibiotics prescribing behavior^{38, 39}. We propose that examining the pandemic vaccination behaviour (individuals choosing to vaccinate and actually performing the behaviour) from a theoretical perspective may be useful to further understand the processes that underlie this behaviour.

Psychological theories of behaviour and vaccination

Theories of behaviour can be applied to better understand causal pathways underlying the behaviour and behaviour change at the individual level³⁵. While different psychological theories have been cited in studies of the vaccination behaviour, the role of theory in the studies is not always clear. Constructs comprising the Health Belief Model are often used in studies of the vaccination behaviour across different types of vaccines including childhood vaccines⁴⁰, human papilloma virus vaccine⁴¹, influenza vaccine^{42, 43}, hepatitis A or B vaccines⁴⁴⁻⁴⁶, and vaccines against sexually transmitted infections⁴⁷. Examples of other theories used to study the vaccination behaviour across different types of vaccines include: Theory of Planned Behaviour^{44, 48-50}, Theory of Reasoned Action⁴⁷, Social Cognitive Theory⁴⁵, Protection Motivation Theory⁵¹, and Social Learning Theory⁴⁵.

While research examining the predictors of seasonal influenza vaccination is extensive, few studies have applied theory. Some theories that have been used in the study of seasonal influenza vaccination include: Health Belief Model^{42, 43, 52}, Multi-attribute Utility Theory⁵³, and Multidimensional Locus of Control⁵². In comparison to seasonal influenza vaccination, studies examining pandemic H1N1 vaccination are fewer in numbers and a recent review reported that few studies have employed a theory to predict this behaviour⁵⁴. When a theory was used, the Health Belief Model was more often employed; other theories include Self Regulation Model, Protection Motivation Theory, and Extended Theory of Planned Behaviour⁵⁴.

Theoretical domains framework

Theories of behaviour can be applied to better understand the reasons for low ERV uptake and to inform interventions to optimize vaccination rates in future public health

emergencies. As described previously, many theories and associated theoretical constructs have been applied in vaccination research. There are disadvantages in drawing from a large pool of theories and overlapping theoretical constructs⁵⁵. The first problem is the lack of logical basis for selecting one theory over another. Furthermore, important causal pathways may be missed when a single theory or a limited number of theories are selected to examine a targeted behaviour.

To address this predicament, Michie and colleagues developed a consensus-based approach to aggregate theories and theoretical constructs into key domains relevant to behaviour change⁵⁵. Michie's work identified 128 theoretical constructs (components of a theory) from 33 psychological theories that are relevant to behaviour change. Consensus among the selected group of experts (health psychology theorists, health services researchers, and health psychologists) narrowed the list to a set of 100 constructs that are most relevant to understanding and changing behaviour. The constructs were grouped into twelve theoretical domains, with each domain encompassing a set of similar constructs. The resulting product is the theoretical domains framework (TDF), presented in Table 1. Since the TDF encompasses constructs from a wide range of behaviour theories, it enables researchers to examine a specific behaviour from the point of view of many theories without having to choose from the plethora of available theories.

Table 1. Theoretical domains and examples of component constructs for investigating the implementation of evidence-based practice.⁵⁵

Domains	Constructs
1. Knowledge	Knowledge about condition/scientific rationale Schemas + mindsets + illness representation
2. Skills	Competence/ability/skill assessment Coping strategies
3. Social/professional role and identity	Group/social identity Social/group norms
4. Beliefs about capabilities	Self efficacy

	Perceived behavioural control
5. Beliefs about consequences	Outcome expectancies Anticipated regret Beliefs & attitudes Characteristics of outcome expectancies
6. Motivation and goals	Intention Intrinsic motivation
7. Memory, attention, and decision processes	Memory Decision making Attention
8. Environmental context and resources	Resources/material resources Environmental stressors
9. Social influences	Group conformity Social/group norms Social pressure Social support
10. Emotion	Stress Fear Threat
11. Behavioural regulation	Implementation intention Generating alternatives Self monitoring Barriers & facilitators
12. Nature of the behaviour	Routine/automatic/habit Breaking habit

Despite the presence of mass vaccination campaigns in Canada, the uptake of the 2009 pandemic H1N1 vaccine was not much different from the initial demand for the vaccine. The public's reluctance to get vaccinated with the pandemic H1N1 vaccine may have demonstrated that there was a lack of understanding of factors that influenced the individual's decision to get vaccinated with an ERV. Applying a theory lens to further explore the processes underlying this behaviour may provide a more comprehensive understanding of the underlying causal pathways. Michie's work allowed us to apply a distilled set of psychological constructs known to be related to other behaviours and behaviour change to examine the decision to vaccinate during a public health emergency. Applying the TDF to examine vaccination provides a systematic approach to identifying theoretical domains containing constructs that are relevant to vaccination rather than

choosing one behaviour theory over other suitable theories, or testing several theories to determine the most appropriate theory.

By identifying domains that are relevant in the vaccination context, theoretically-motivated behaviour change techniques that are likely to induce change in these domain constructs may be incorporated into future interventions aimed at increasing vaccination. Behaviour change techniques are activities designed to change specific behaviour patterns⁵⁶. Designing theoretically-motivated interventions based on behaviour change techniques will enable researchers to better understand the mechanism of behaviour change and to influence change in a specific behavior. Preliminary work by Michie⁵⁷ resulted in the identification of 35 behaviour change techniques (Appendix A) that are linked to theoretical domains presented in the TDF and may be effective in changing the target behaviour. The application of theory to inform interventions aimed at increasing the uptake of ERVs can help public health authorities to select behaviour change techniques and tailor interventions to be more effective in persuading individuals within the general public to change their behaviour in future public health emergencies^{58, 59}.

Mixed methods approach

In this thesis, a mixed methods approach combined elements from both qualitative and quantitative paradigms to better understand the complex behaviour of adopting a new vaccine released during a public health emergency.

Quantitative research methods, particularly surveys, are commonly used in the vaccination literature to examine the relationship between vaccination and predictors of this behaviour. Surveys are good for measuring opinions of populations and are generally designed to draw data from representative samples of the targeted population. The first step of this research project was a systematic review of the current survey literature to summarize the predictors of pandemic vaccination in members of the general public.

Qualitative research methods have also been applied to gain a better understanding of barriers to vaccination¹⁵. Qualitative research is exploratory in nature, and the data collected aims to answer the “what” and “why” questions⁶⁰. Data from qualitative research contribute to new knowledge, provide insight into a health-related phenomenon, and can enrich future research studies⁶¹. Examples of common qualitative research methods used in health research include in-depth interviews or focus groups involving smaller, non-representative samples of participants.

To date, published studies of the issues influencing vaccination during the H1N1 pandemic collected data using surveys; to the researchers’ knowledge qualitative studies have yet to be conducted to examine this behaviour. In this research project, focus groups were conducted to gain further insight on the vaccination behaviour during the H1N1 pandemic and to uncover possible causal pathways underlying this behaviour through the application of a theoretical framework.

An approach that involves a combination of research methods can improve the validity of the evidence⁶⁰. In this project, data from the systematic review and focus group discussions were converged in the analysis to produce triangulated findings. Overall, a mixed methods approach enabled a greater insight into this complex behaviour than would be gained by using a single method⁶².

OBJECTIVES AND RESEARCH QUESTIONS

The overall objective of the project is to determine the factors influencing the use of an ERV, using the 2009 H1N1 pandemic vaccine as a case study. Furthermore, the project uses the theoretical domain framework to determine whether theories of behaviour can help us better understand the predictors of the individual vaccination behaviour. The mixed methods approach aims to address the following research questions:

Systematic review

1) What is the existing evidence on the barriers or facilitators of the use of a pandemic or H1N1 vaccine?

Focus groups

- 2) What beliefs influenced the pandemic H1N1 vaccination decision making process?
- 3) What theoretical domains are relevant to the pandemic vaccination behaviour?

SYSTEMATIC REVIEW

Methods

Search Strategy

Key articles on the thesis topic were found through a preliminary search of the existing literature (conducted by TN). With the help of a research librarian, articles relevant to the research topic were used to develop search strategies based on Medical Subject Headings (MeSH) and keywords. The strategies combined terms that represented attitudes, perceptions, barriers, and facilitators with terms relating to disease outbreaks and vaccination. The full search strategies are presented in Appendix B. The searches were supplemented by a review of the references of key articles on the topic. A systematic search of the literature was conducted on July 26, 2010 using MEDLINE (Ovid interface: January 1950 to July 26, 2010), EMBASE (Ovid interface: 1947 to July 26, 2010), and PsycINFO (Ovid interface: 1806 to July 26, 2010).

Selection criteria

To be included in this systematic review, studies needed to satisfy the following six selection criteria: 1) the study data had to be obtained from a quantitative survey, 2) the study population was the general public, 3) the intervention of interest was a pandemic or H1N1 vaccine, 4) the study reported on the personal intention to get vaccinated or the actual vaccination rate with the vaccine, 5) the study reported on predictors of the vaccination behaviour using univariate or multivariate analyses, 6) lastly, due to the resource intensive nature of translating studies into English, this review only examined studies written in English.

Study Selection

All abstracts generated by the searches were added to a database and duplicates were removed prior to screening. Two reviewers (TN, EH) independently screened the abstracts for eligibility in order to minimize subjectivity in the study selection process⁶³. In the initial screening, the two reviewers examined the title, abstract, and keywords of each article to determine if the inclusion criteria were met. When it was unclear as to whether an abstract met all the inclusion criteria, or when there were differences between the reviewers, the abstract of interest was also retained for further examination. Following the initial screen, full-length articles of the screened abstracts were obtained and examined by the two independent reviewers using the selection criteria. The study selection form is presented in Appendix C. Any differences between the reviewers were discussed and resolved by consensus. In cases where consensus was not achieved, a third reviewer (KW) addressed the discrepancies that arose. All articles that met the inclusion criteria were included in the final meta-synthesis. The references of these articles were reviewed to ensure relevant articles were not missed.

Data extraction

A data extraction form was developed by TN to collect data for the review (Appendix C). Prior to the systematic review, a preliminary review of the literature on vaccination was conducted by TN. This review identified issues of risks, issues relating to a vaccine and vaccination, and issues of access to be broad themes that encompass the major predictors of vaccination. These themes were used to inform a coding template within the extraction form to categorize variables associated with pandemic vaccination. The data extraction form was piloted by two reviewers (TN and KHH) using two studies^{30, 64} randomly selected from the

list of studies included in the review. The pilot enabled the reviewers to further refine the form and the themes within the coding template.

The following data was extracted: the study populations, the sample size, the study location and period, the study methods, the objectives, the outcome measures of the study, and variables associated with vaccination. The data extraction form also included a short checklist of key data collection items to report in survey research, which was adapted from reporting guidelines published by Kelley⁶⁵. The checklist consisted of eleven open-ended questions on the sample selection and data collection methods to ensure that the processes were rigorous and ethical.

The data extraction was conducted independently by the two reviewers using the constant comparative method⁶⁶. Through this method, data from each study reviewed was compared throughout the extraction process, and the data extraction form was modified to accommodate new themes. Both reviewers met to discuss the results of the data extraction process and differences were resolved by consensus.

Data synthesis

Using the coding template, the reviewers (TN and KHH) extracted quantitative survey data on the relationship between the intention to vaccinate with a pandemic vaccine and determinants of this intention. The data were extracted when authors reported in their analyses a statistically significant relationship between the vaccination intention and the predictor. When both univariate and multivariate analyses were available, data from the multivariate analysis were preferentially extracted. When the data were presented as percentage values, the top three reasons for intending or not intending to get vaccinated were extracted. In some studies, the data presented were unclear, or a narrative description of

some predictors of the intention to vaccinate was provided without tabulated data. We contacted all the authors to review and complete as many of the missing fields as possible. Any additional data provided by the authors were incorporated into the existing data extracted for the review. Kappa scores were calculated to determine the chance-adjusted inter-observer agreement in the abstract screening and the study selection processes. Due to the heterogeneity of the populations and survey methods covered by the studies included in the review, as well as a lack of guidelines on combining survey data, statistical pooling was not appropriate and the data extracted was summarized in a narrative form.

Results

Study selection and characteristics

Figure 2 describes the process of selecting studies for this systematic review. The search strategies identified 720 abstracts and titles and of these, 51 studies met the screening criteria and the full articles were pulled for further analysis. A total of ten studies met the final inclusion criteria and were included in the systematic review. There was excellent agreement between the two reviewers for the initial screening of the abstracts ($\kappa = 0.97$), and the selection of the final articles ($\kappa = 1.00$).

Of the ten authors contacted for additional data or for clarification of data, five authors responded^{30, 67-70}. Four of the five authors provided additional data from their respective studies; the data were extracted and incorporated into the review^{67, 68, 70, 71}.

The characteristics of the studies included in the review are summarized in Table 2. Nine of ten studies included in the analysis surveyed the general population of adults aged 18 years or older; one study surveyed participants aged 16 years or older⁶⁹. The methods of survey administration included: telephone surveys ($n = 4$), online surveys ($n = 3$), paper-based surveys ($n = 2$), and one survey was conducted in person. Five of the surveys were self-administered^{30, 70, 72-74} while others were delivered by interviewers. The response rate for the surveys ranged from 8%⁶⁹ to 80%⁶⁷. The sample size of the ten studies varied greatly from 207⁶⁷ to 5175⁶⁹ respondents. The studies included in this review were conducted in a wide range of geographic locations. Three studies were conducted in the USA^{67, 72, 73}, four were conducted in Europe^{30, 69, 74, 75}, two studies took place in Australia^{68, 70}, and one in Hong Kong⁶⁴. All except one⁷² of the studies were conducted during the 2009 H1N1 influenza A pandemic. Five of these surveys were administered before the availability of the H1N1

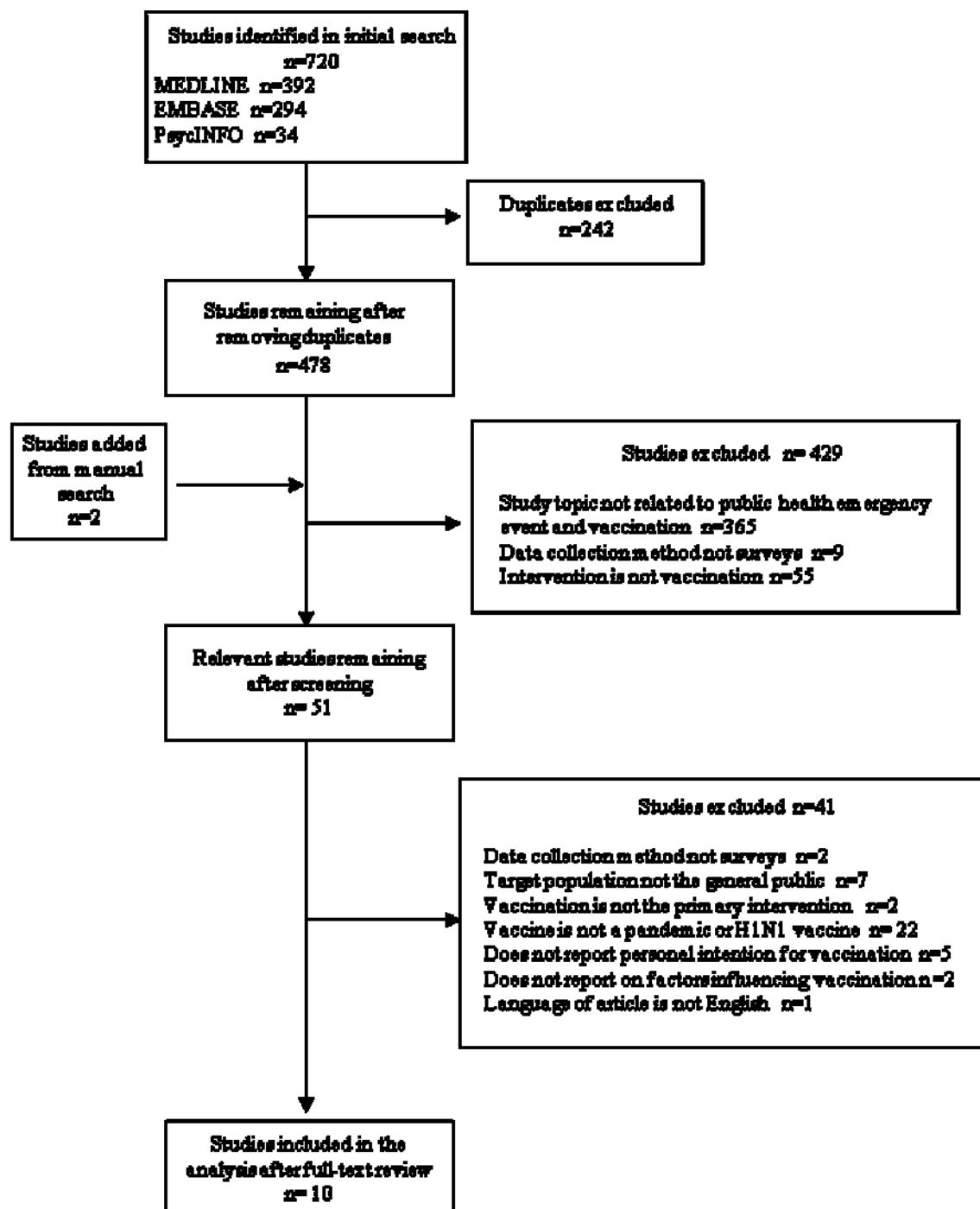


Figure 2. Selection of studies for the systematic review.

Table 2. Summary of the characteristics of the studies included in the review.

Study	Year	Country	n	Time of survey administration (date)	Survey administration method	Survey response rate	Characteristics of participants	Outcome measures	Intention to receive pandemic vaccine
Quinn et al. ⁷³	2009	USA	1543	Before the approval of the vaccine (June 3-administration July 6, 2009)	Online survey, self	62%	Adults 18+ years old	Intention to accept an unapproved vaccine or drug, perceived susceptibility, risk severity of H1N1 flu, level of trust in government handling outbreak	8.7%
Sypsa et al. ⁷⁵	2009	Greece	1000 per week	(last week of August-November 1, 2009)	Telephone survey	Not reported	Not specified	Intention to accept the pandemic influenza A (H1N1) vaccine, determinants of the intention to vaccinate (knowledge, demographic , behavioural factors, risk perception), stated reasons for declining vaccination.	9.1-22.9% depending on time of survey
Eastwood et al. ⁶⁸	2010	Australia	830	During pandemic (August 20 - September 11, 2009)	Computer assisted telephone interviews by interviewers	72%	Adults 18+ years old	Intention to accept vaccination, determinants of the intention to vaccinate (demographic , behavioural factors, risk perception, previous acceptance of seasonal influenza vaccine)	67%
Horney et al. ⁶⁷	2010	USA	207	Before vaccine availability for distribution (August 28-29, 2009)	In-person structured interviews by interviewers	80%	Adults 18-92 years old	Intention to be vaccinated, determinants of the intention to vaccinate (demographic , behavioural factors, risk perception, previous acceptance of seasonal influenza vaccine), stated reasons for not intending to receive vaccination	64%
Lau et al. ⁶⁴	2010	Hong Kong	301	Before availability of vaccine (July 2-8, 2009)	Telephone by interviewers	79.6%	Adults 18-60 years old	Intention to receive H1N1 vaccine under several hypothetical scenarios: 3 different prices for vaccine, availability of data on safety and efficacy. Determinants of the intention to vaccinate: knowledge of beliefs about transmission, perceptions related to disease	15-45% for different prices of the vaccine 5% for absence of data on efficacy and safety
Maurer et al. ⁷²	2010	USA	3917	After 2009 vaccination season (March 4-24, 2010)	Online survey, self administration	74%	Adults 18+ years old	Vaccination rate; perceptions of seriousness of pandemic; perceptions of safety and value of the vaccine; most influential information sources in vaccination decisions	20% self reported uptake rate
Rubin et al. ⁶⁹	2010	UK	5175	Before swine flu vaccination campaign the H1N1(May 8-vaccine) September 13, 2009)	Telephone by interviewers	8-11%	Participants 16 + years old	Intention to accept the vaccine, influence of media on level of worry, psychological determinants of the intention to vaccinate, effects of advertising and media on behavioural change during outbreak	56.1%

Schwarzinger et al. ⁷⁴	2010	France	2167	During mass vaccination campaign (November 17-25, 2009)	Online survey, self administration	12%	Adults 18-64 years old	Intention to accept the vaccine. Socio-demographic characteristics; behaviours/attitudes towards vaccination; risk perception	17%
Seale et al. ⁷⁰	2010	Australia	627	Immediately before availability of vaccine (September 5-October 3, 2009)	Self administered in person	47%	Adults 18+ years old	Intention to accept the vaccine, determinants of the intention (risk perception, attitudes, behavioural responses, demographic factors)	54.7%
Zijlregtop et al. ³⁰	2010	Netherlands	508	1 month prior to the first announcement of outbreak of H1N1 in Mexico (April 2009)	Self administered postal questionnaire	33.9%	Adults 18+ years old	Intention to vaccinate with the pandemic flu vaccine, determinants of the intention (behavioural, organisational, demographical).	65.5%

vaccine in the respective countries^{64, 67, 69, 70, 73}.

The self-reported intention to vaccinate with a pandemic vaccine was evaluated in nine studies. The intention to vaccinate ranged from 8%⁷³ to 67%⁶⁸. The study by Maurer was the only study in this review that was conducted after the vaccination campaign and reported an actual vaccination rate of 20% for H1N1 influenza A pandemic vaccine in their study population⁷².

Determinants of the intention to receive vaccination

Tables 3 and 4 present the factors identified in the studies to have influenced the intention to receive a pandemic vaccine. These factors were categorized under the following themes: risk perceptions, beliefs about vaccination (other than risks associated with vaccination), social influences, access, demographic variables, and others. The major themes summarized factors that share similarities in content.

Risk perceptions

Risk perceptions were consistently shown to be associated with the intention to vaccinate with the pandemic vaccine (Table 3). The risks perceived as relevant to the vaccination intention included: perceived severity of the pandemic, perceived risk of infection, perceived risk of severe consequences from infection, and perceived risk of adverse-events from vaccination. Nine of the ten studies reported data relating to risk perceptions^{30, 64, 67-70, 73-75}.

Table 3. Themes identified as predictors of the intention to vaccinate with the H1N1 pandemic vaccine by the general public.

Theme	Beliefs	Quinn 2009 ⁷³	Sypsa 2009 ⁷⁵	Eastwood 2010 ⁶⁸	Horney 2010 ⁶⁷	Lau 2010 ⁶⁴	Maurer 2010 ⁷²	Rubin 2010 ⁶⁹	Schwarzinger 2010 ⁷⁴	Seale 2010 ⁷⁰	Zijtregtop 2010 ³⁰
Risk perceptions	Risks of vaccination	0.11d	1	2	2	0.33			1	3	
		0.36d							2		
	Risk of infection		2.72b		1.55c			2.2		2	4.1
			3.26b		1			4.7			
	Severity of personal consequences from infection	1.64			3				3.61		1.9
									3		
	Severity of pandemic			1.84				1.2a	1.65	2.5	
								1.3a		1	
Vaccination beliefs	Previous acceptance of seasonal influenza vaccination	3.37d		5.03	1.47e	3.08f			3.21	2.7	NS
		1.84d			1.27e						
	Belief of vaccine effectiveness or necessity			1		NS				2	1.7
	Vaccination attitude			3							3.8
Social influences	Recommendations from health care professionals						2		4.57g		NS
									0.57g		
	Public health messages						3				5.0
	Influence of family and friends					4.04f					1.8
Access	Priority group								5.09h		
									1.66h		

	Convenience/ Inconvenience			3		
	Financial costs/insurance	NS		NS		NS
	Vaccine delivery			NS		
Others	Knowledge of disease/vaccine	NS		NS	1.5	
	Self protection				1	1 NS
	Societal role/responsibility				8.0	2
	Alternative methods of protection					1.8
	Government preparedness/ trust in government	NS			1.6	
	Employment requirement				1	

Real numbers represent odds ratios (OR).

Integer refers to a category being reported as one of the top three factors influencing the intention to vaccinate or not vaccinate.

Bolded type indicates that the outcome is the intention to vaccinate, while normal type indicates that the outcome is the intention to not vaccinate.

NS- no statistical significance in the association between the category with the intention to vaccinate or not vaccinate.

a Proximity and severity of public health issue respectively

b Varying perception of the likelihood of infection and severity

c Study reported prevalence ratio instead of odds ratio

d Answering yes or don't know to various statements relating to vaccination

e Having received seasonal influenza vaccine previously in different years

f Midpoint for range of ORs for association with uptake of H1N1 vaccination under different cost scenarios

g Different levels of advice from healthcare professional

h Different priority groups: pregnant women, chronic diseases

The perception of risks associated with vaccination was a consistent predictor of the intention to vaccinate. These risks included: overall concerns about the vaccine, concerns about vaccine safety, and perceived side-effects of vaccination. Data on the perception of risks associated with vaccination were reported in seven studies^{64, 67, 68, 70, 73-75}. Two studies demonstrated a strong and significant statistical association between the perception of risks associated with vaccination with a lower intention to be vaccinated^{64, 73}. In one study⁷³, participants who were more worried about the vaccine were 90% less willing to accept the vaccine (OR = 0.11). Respondents in five other studies reported the perception of harm or adverse events from the vaccine as one of the top determinants of the intention to accept or decline the pandemic vaccine^{67, 68, 70, 74, 75}.

The perception of one's risk of being infected by the virus was another consistent predictor of the intention to vaccinate. Five studies reported data pertaining to this relationship^{30, 67, 69, 70, 75}. Analyses in four of the five studies consistently demonstrated a significant association between the perception of being at higher risk of infection with the intention to accept the pandemic vaccine^{30, 67, 69, 75}. In one study, participants who had higher levels of worry about personally catching the pandemic flu were almost five times more likely to accept the vaccine (OR = 4.7)⁶⁹. Two studies also reported perceived risk of infection as among the top three reasons influencing the intention to vaccinate^{67, 70}.

The perception of severity of consequences from infection was another perception associated with the intention to vaccinate. Two studies demonstrated that the perception of severe consequences from infection was associated with higher intention to accept the vaccine^{73, 74}. Conversely, one study showed that the perception of mild consequences from infection was associated with the intention to decline the pandemic vaccine³⁰.

Another important predictor of the intention to vaccinate was the perception of the severity of the H1N1 pandemic. This risk perception included: the perceived seriousness of the situation, perceived proximity of the event, or perceived high morbidity/ mortality associated with the pandemic. Analyses from four studies consistently suggested that perceiving the pandemic to be severe was moderately associated with the intention to vaccinate; the ORs ranged from 1.2 to 2.5^{68-70, 74}.

Vaccination beliefs

Beliefs about vaccination were shown to be an important influence in the intention to vaccinate with the pandemic vaccine^{64, 67, 68, 70, 73, 74}. This set of determinants included: beliefs of the effectiveness or necessity of the vaccine, acceptance of previous vaccination, and overall attitudes towards vaccines.

An individual's prior receipt of the seasonal influenza vaccination was a significant predictor of the intention to vaccinate with the pandemic vaccine. The strength of the association in the six studies that examined this relationship ranged from 1.27 to 5.03^{64, 67, 68, 70, 73, 74} suggesting that previous acceptance of seasonal influenza vaccination strongly predicts the intention to vaccinate with a pandemic vaccine. In one study, people who previously obtained a seasonal influenza vaccination were shown to be five times more likely to accept a pandemic vaccine (OR = 5.03)⁶⁸.

Other beliefs about vaccination were also shown to influence the intention to vaccinate. These included the belief of vaccine effectiveness or necessity^{30, 68, 70} and overall attitude about vaccination^{68, 70}.

Social influences

Social influences were important determinants of the intention to vaccinate with a pandemic vaccine^{30, 64, 72, 74}. Sources of influence shown to be important were recommendations from healthcare providers^{30, 72}, public health messages^{30, 72}, and influences from family and friends^{30, 64}. Recommendations from health care professionals was the source of influence most strongly associated with the intention to vaccinate. One study showed that respondents who received recommendations for vaccination from a primary care physician were almost five times more likely to accept the pandemic vaccine (OR=4.57)⁷⁴. Conversely, respondents who did not receive positive advice for vaccination were more likely to decline the vaccine (OR=0.57)⁷⁴.

Access

Factors related to access to the vaccine were not shown to be consistent predictors of the intention to vaccinate. These factors included: priority groups, convenience, financial costs/ insurance, and vaccine delivery. Of the four studies^{30, 67, 73, 74} that examined factors relating to access, only one study⁷⁴ identified access to be important in the intention to vaccinate. This study reported people within priority groups such as pregnant women (OR=5.09) and people with chronic diseases (OR=1.66) were more likely to accept a pandemic vaccine compared to those who were not in a priority group⁷⁴.

Others

This category contains a mix of variables that did not fit into the themes previously described. Knowledge of the disease or vaccine was not shown to be a consistent predictor of the intention to vaccinate. Only one⁶⁹ of three studies^{67, 69, 75} identified a statistically significant relationship between knowledge and the vaccination intention. Self-protection was cited to be the top reason influencing the intention to vaccinate against H1N1 in two studies^{70, 74}. Aside from self-protection, the sense of social role/responsibility (getting vaccinated to protect others) was shown in one study to increase the intention to⁶⁹ while respondents in another study⁷⁴ cited it among the top factors to influence the intention. There was no clear trend towards statistical significance for other variables in this mixed category. These variables included alternative methods of protection, trust in government, and employment requirement.

Demographic and socio-economic variables

The associations between demographic and socio-economic variables with the intention to vaccinate with a pandemic vaccine are summarized in Table 4. The relationship between age and the intention to vaccinate was shown to be inconsistent across seven studies. Three studies found that people who are older were less likely to accept a pandemic vaccine^{68, 69, 75}, while one study found the opposite, that older respondents were more likely to accept the vaccine⁷⁴. Three other studies^{64, 67, 70} found no significant differences between age groups and the intention to accept a pandemic vaccine.

Table 4. Demographic and socio-economic variables identified as predictors of vaccination with the pandemic H1N1 vaccine by the general public.

	Quinn 2009 ⁷³	Sypsa 2009 ⁷⁵	Eastwood 2010 ⁶⁸	Horney 2010 ⁶⁷	Lau 2010 ⁶⁴	Maurer 2010 ⁷²	Rubin 2010 ⁶⁹	Schwarzinger 2010 ⁷⁴	Seale 2010 ⁷⁰	Zijtregtop 2010 ³⁰
Age		1.85a	1.64b	NS	NS	-	1.6b	1.41a	NS	
						-		2.11a		
Sex		2.75c	1.86d	NS	NS	-	NS	0.57c	NS	NS
Ethnicity	3.27e			NS		-	1.9e		1.6e	
Education	0.40f	NS				-		0.53g		NS
Community/household characteristics		1.60h		NS		-	2.1h	1.68h		NS
		1.56i				-	NS	0.61i		
		NS				-				
Self-perceived health	0.41					-	1.5j	NS		
						-	1.4j			
Occupation/Social grade/work status				NS	NS	-	NS	1.49-2.18k		
Marital status					NS	-				

Real numbers represent odds ratios.

Bolded type indicates that the outcome is the intention to vaccinate, while normal type indicates that the outcome is the intention to not vaccinate.

NS -no statistical significance in the association between the category with the intention to vaccinate or not vaccinate.

a Older age groups compared to younger age group (<= 34 years old)

b Younger age groups compared to older age group (60+ years old)

c Reference is men

d Reference is women

e Other ethnic backgrounds compared to white/Caucasian

f Higher levels of education compared to high school level of education

g Lower levels of education compared to university education

h Physical household related variable

i Physical community related variable

j Different statements about one's health

k Variety of occupations compared to clerical

The evidence across the studies yielded similar inconsistent results for the relationship between sex and the intention to vaccinate. Eight studies examined this association and five of the eight studies found this relationship to be insignificant^{30, 64, 67, 69, 70}. The findings of the remaining three studies demonstrated that women were more likely to decline a vaccine^{68, 74, 75}.

Ethnicity was shown to have a consistent relationship with the intention to vaccinate. Three studies found a significant association between ethnicity and the intention to vaccinate^{69, 70, 73}. The data (OR=1.6 -3.27) suggested that people who were not of Caucasian background were more likely accept a pandemic vaccine^{69, 70, 73}. There was no clear trend towards statistical significance for other demographic and socio-economic variables. These variables included education, occupation, marital status, household characteristics, and self-perceived health.

Discussion

In a public health emergency, the success of emergency vaccination campaigns will depend on the decision of individuals within the general public to get vaccinated. Promoting the uptake of an ERV by the target population may be challenging for public health authorities if the barriers to vaccination have not been identified and hopefully overcome by intervention strategies. Determining the factors influencing the decision to vaccinate during a public health emergency may inform future interventions to address these factors, thus may help increase the vaccination rate within the general public. The first phase of this mixed methods project systematically reviewed the existing survey literature on the determinants of the intention to vaccinate with a pandemic vaccine, in order to understand what is known about the decision-making processes and vaccine acceptance during a public health emergency. The evidence from this systematic review⁷⁶ suggests issues relating to risk perceptions, previous receipt of the seasonal influenza vaccine, recommendations by healthcare professionals, and ethnicity as important determinants of the intention to vaccinate with the 2009 pandemic H1N1 vaccine by individuals within the general public.

Important barriers to the intention to vaccinate during the H1N1 pandemic included: the perception that the pandemic is not severe; the risk of being infected by the virus, or the risk of severe consequences from infection is low. A lower intention to vaccinate was also associated with a high perception of risks associated with vaccination. The findings from this review are also consistent with recent reviews examining the acceptance of the pandemic H1N1 vaccine in all populations^{54, 77} and protective behaviours (including vaccination) during the pandemic in the general population⁷⁸. Among these studies, perceptions of risks including perceived susceptibility to the disease^{54, 77, 78}, perceived severity of the consequences^{54, 77, 78}, and perceived risk of harm from vaccination^{54, 77} were important determinants of the behaviour. The evidence suggests that developing strategies to modify an individual's perception of risks may help encourage members of the general public to obtain

vaccination during public health emergencies. Strategies that are effective in increasing people's perceptions of risks while providing advice to manage these risks have been shown to be more effective in changing the desired behaviour⁷⁹. In the context of vaccination, increasing people's perceptions of risks related to the pandemic while providing strong messages advocating vaccination as a way to mitigate the risks may be effective in increasing the acceptance of a future ERV.

An individual's past acceptance of seasonal influenza vaccination was another important and consistent predictor of the intention to vaccinate during the pandemic. Recent reviews also demonstrated a strong relationship between past uptake of seasonal influenza vaccine and the intention to vaccinate against H1N1^{54, 77}. Another review suggests that the perceptions of risks associated with seasonal influenza is directly transferred into perceptions of risks associated with pandemic influenza, hence linking the decision-making process about vaccination during the pandemic with the decision to vaccinate during the seasonal influenza epidemics⁸⁰. The evidence suggests that public health authorities should consider implementing strategies to increase the rate of seasonal influenza vaccination within the general public in preparation for future public health emergencies. Effective vaccination campaigns that increase the acceptance of seasonal influenza vaccination prior to the next pandemic may ultimately increase the acceptance of an ERV in future public health emergencies.

Healthcare providers play an essential role in delivering health-related information, recommendations, and health services to patients. In this review, as well as in more recently published reviews^{54, 77}, recommendations from healthcare providers were shown to be an important predictor of the intention to vaccinate during the pandemic. Therefore, public health organizations should consider engaging healthcare providers in providing recommendations for vaccination as well as in the vaccine delivery process early in a future public health emergency.

In addition, the current evidence from our study and other reviews^{54, 77} also suggest that some demographic sub-populations, such as different ethnic groups, were more reluctant to accept the H1N1 vaccine. In countries with a heterogeneous mix of ethnic groups, it is necessary to have a better

understanding of cultural differences towards the pandemic (general attitudes and beliefs) and vaccination (support for the public health response and preventative measures, and compliance with public health measures)⁸⁰. Interventions to address differences between sub-populations within the general public may include targeted messaging for individuals of different ethnic groups to encourage vaccination in people who are more reluctant.

Limitations

The present systematic review has important limitations. When a determinant is not reported to be a consistent predictor of the vaccination intention in this review, it may be a consequence of some surveys not asking specific questions related to the determinant or not reporting data related to it because the relationship was not statistically significant. Consequently, this review may not adequately summarize the current trend between the intention to vaccinate with the pandemic H1N1 vaccine and the range of existing determinants. In cases where too few studies reported on a determinant, it was not possible to identify a clear trend between the intention to vaccinate and that determinant. Non-English-language papers were excluded from the study due to a lack of resources available for translation. As well, translating non-English-language papers to English may result in a distortion of the meaning of themes and may result in subsequent misclassification of data. As a result, the findings presented are not generalizable to non-English-speaking populations. Another limitation resulting from the exclusion of non-English language papers is the possibility of reporting biases that may occur as statistically significant (positive) studies are more likely to be submitted and accepted for publication in English⁶³.

This review is also limited by the quality and biases inherent in the original studies, including selection bias and reliance on self-report responses. Thus, the intention to vaccinate presented in the original studies may be over-reported or under-reported, and/or the true measure of association between a determinant and the intention to vaccinate may be biased either towards or away from the null. Another limitation is that all but one⁷² of the surveys included were conducted before the availability of

the pandemic H1N1 vaccine or during the vaccine distribution period, hence the surveys mainly examined the intention to get vaccinated. The intention to get vaccinated may not be a true indication of how individuals would behave in an actual pandemic, as intention does not consistently translate to behaviour⁸¹. Further research to explore the factors that influenced the vaccination behaviour during the H1N1 pandemic is necessary for a complete understanding of the behaviour pre- and post-pandemic. The second phase in our mix methods approach, using qualitative focus groups, has the advantage that the vaccination behaviour had already occurred and participants were able to reflect on their actual behaviour. The evidence from this second phase related to the vaccination behaviour itself rather than the intention to carry out this behaviour.

The development of interventions to modify an individual's vaccination behaviour not only relies on identifying the predictors of the behaviour, it can be further enhanced by applying theories of behaviour. The use of theory in the development of behaviour change interventions has several benefits including understanding the causal pathway of the behaviour and behaviour change. It also facilitates the identification of constructs that are related to the behaviour, hence can serve as targets for interventions⁸². Of the ten surveys included in this systematic review, only three studies^{30, 64, 69} referenced theories of behaviour in their research. Further research exploring the theoretical constructs relevant to the pandemic vaccination behaviour can guide the selection and tailoring of intervention strategies that maybe more effective in increasing the uptake of a future ERV. The qualitative method in the second phase of this project employed a theoretical approach to gain insight into the psychological processes underlying the complex decision to accept or decline vaccination during a public health emergency.

Conclusion

This review suggests that the factors consistently associated with intention to accept or decline the pandemic H1N1 vaccine include: risk perceptions, past acceptance of the seasonal influenza vaccine, recommendations from healthcare providers, and ethnicity. In future emergency vaccination campaigns, public health officials should be cognizant of these issues in hope of increasing acceptance of a future ERV by the general public. In particular, the components of risk perceptions, acceptance of seasonal influenza vaccination, and recommendations by healthcare providers represent potentially modifiable factors that officials could develop strategies to target prior to and during the release of an ERV. By addressing these factors proactively, public health officials may increase the uptake of an ERV and reduce the overall impact of the emerging disease.

FOCUS GROUPS

Methods

This study was approved by the Ottawa Hospital Research Ethics Board.

Participants

The focus group participants were recruited primarily through advertisements (Appendix D) in the free local (Ottawa) newspaper called the Metro, through a Facebook event invitation from TN or KHH, and by advertisement on Dr. Kumanan Wilson's Public Health Policy website (<http://www.publichealthpolicy.org/>). Some participants were recruited through snowball sampling method, where subjects interested in participating recruited other people to participate in the focus groups. Members of the general public who were interested in participating in the focus groups were provided with the option to call or email TN or KHH. For purposive sampling, a screening questionnaire was administered to interested volunteers to screen for participants that met the study criteria (Appendix E).

The following criteria were used to select the participants:

- 1) persons aged 18 years and older,
- 2) English speaking and are living in Ottawa and Outaouais region
- 3) competent to provide informed consent to participate in the focus groups

The recruitment goal was to have participants varying in age, gender, and to have relatively equal distribution in H1N1 vaccination status. We also aimed to have similar proportions in people who were deemed to be a priority for the vaccine and those who were not in each focus group. Five focus groups were conducted with the goal of achieving thematic saturation to be consistent with standard qualitative research methods⁴⁵ and based

on Dr. Wilson's experience in conducting qualitative studies of the anti-vaccination movement. A sample of five to eight participants was recruited for each of the focus groups.

Pilot focus group

A pilot focus group was conducted in October 2010, prior to the scheduled focus groups. The participants of this pilot consisted of employees and researchers at the OHRI (thesis supervisors and five individuals not involved in the study). The objectives of the pilot focus group were to:

- assess the feasibility of using the focus group guide
- obtain estimates of time for the various sections within the question guide
- observe respondents' reaction to the questions on the focus group guide
- provide a preliminary indication of responses
- determine the effectiveness of the facilitator (TN) and the facilitating process with an assistant (KHH).

The pilot focus group allowed the main facilitator (TN) to gain practical experience in conducting a focus group. The main facilitator also obtained training prior to the pilot by reviewing the current literature on conducting focus groups, consulting with other researchers experienced in conducting focus groups (AB, AP, RI, JC, KHH), and assisting with focus groups conducted by another researcher (AB). The feedback received from the participants of the pilot on wording issues and ambiguities was used to amend the questions. The number of questions for each domain was reduced to adjust for time constraints associated with the administration of the focus group questions.

Focus group guide

The theoretical domains framework (TDF) was used to guide the focus groups in this second step of the project. Since this framework was not developed specific to the vaccination behaviour, the evidence from the systematic review facilitated the adaption of the TDF to the context of vaccination. The questions in the focus group guide were informed by the knowledge gained from the systematic review on the predictors of the intention to vaccinate during a pandemic. The focus group guide contained general questions about vaccination, and questions to determine whether and how the theoretical domains are relevant in the context of vaccination (Appendix F). The draft of the focus group guide was prepared by the facilitator (TN); the thesis supervisors and a research coordinator (AP) experienced in conducting qualitative studies using the TDF contributed to the review and revision of the guide. The guide was further revised based on the feedback from the pilot session. Small modifications were made to the focus group guide based on the composition of the participants of each group and the flow of discussion during each focus group. Table 5 provides a summary description of each section within the focus group guide.

Table 5. Summary of sections within the focus group guide

Section	Allotted time (minutes)	Description	TDF related component
1 Welcome statement	5	This section provides a summary of the study and clearly defines the objectives of the focus group; and the roles of the participants, the facilitator and the assistant. Participants were asked to complete their informed consent form for participation in the focus group and provide information for the honorarium (\$70).	N/A
2 Introduction	5	This section serves as an ice-breaker to get the participants	N/A

			more familiarized with one another. The participants were asked to introduce themselves and state the reason for their interest in the focus group.	
3	General views on vaccination	10	This section begins the discussion with the participants' general views on vaccination.	N/A
4	Reflections on H1N1 pandemic and vaccine	10	This section asks participants for their thoughts on the pandemic and thoughts about the vaccination program. Participants were also asked if they contracted H1N1 or thought that they did.	Probe for the participants' knowledge about the vaccine (domain <i>knowledge</i>)
5	Personal experience with H1N1 vaccine	10	This section probes for participants' personal experience with the H1N1 vaccine and what they did when the vaccine was available.	Probe for the participants' motivation or need to get vaccinated (domain <i>motivation and goals</i>) as well as confidence in their decision about the vaccine (domain <i>beliefs about capabilities</i>).
6	Main factors influencing the decision to accept or decline the H1N1 vaccine	20	This section focuses on the main factors that influenced the participants' personal decision to accept or decline the H1N1 vaccine.	Probe for the participants': - thinking process (domain <i>memory, attention & decision processes</i>) -beliefs about benefits versus consequences (domain <i>beliefs about consequences</i>) -emotions (domain <i>emotions</i>) -social role(domain <i>social/professional role & identity</i>) -social influences (domain <i>social influences</i>) - logistic barriers (domain <i>environmental context & resources</i>)
7	Sources of	10	This section asks about the	Probe for social

information		participants' sources of information about the pandemic and vaccine.	influences (domain <i>social influences</i>) and the participants' resourcefulness in finding more information (domain <i>skills</i>).
8 Suggestions for changes to facilitate the decision making process	30	This section proposes a similar scenario (pandemic and new vaccine) in the near future and participants were probed for factors that would make their decision on vaccination easier.	Probe for the participants' recommendations (domain <i>behavioural regulation</i>) and intention towards vaccination if the same scenario were to occur (domain <i>nature of the behavior</i>).
9 Closing remarks and thank you statement	5	Thank you and contact information were given in case participants have any questions. Participants are reminded to provide information for the honorarium (\$70).	N/A

During the focus groups, the facilitator used the focus group guide to encourage the participants to interact, share thoughts on their own experiences, and comment on other participants' perspectives. When necessary, the facilitator encouraged the participants to continue the discussion beyond the stage where it may have otherwise ended, and to discuss the inconsistencies in the ideas brought up during the discussions. Many questions from the TDF were only asked to probe for data not previously mentioned by participants during the focus groups.

Field notes taken during the focus groups by the facilitator (TN) contained details on the location, time, number of participants, name of the facilitator, name of the assistant, the names of the participants who were in attendant, and the length of the group discussion. A summary of discussion from the previous night was made by the facilitator (TN) each

morning after the focus group. Personal reflections were made on the general themes arising from the focus group, the general interactions between the participants, and the overall atmosphere of the focus group. The summary was reviewed by the assistant (KHH), who further contributed to the notes with her own reflections. These notes facilitated ongoing updates of the focus group guide. Through these reflections, it was possible to identify questions in the focus group guide that seemed to be unclear to the focus group participants or were not applicable to certain participants. Responses from the participants were also taken into account when refining the questions for subsequent focus groups.

Quality control and data collection management

a) Two digital recorders were used to ensure that the focus groups were properly recorded. One recorder was placed at each end of the table to catch utterances by individuals who spoke quietly or individuals sitting at the end of the table. Both copies of the recording for each focus group were given to the transcriptionist.

b) During the data collection period, several methods were used to ensure data quality and to optimize collection. The facilitator's assistant (KHH) with expertise and previous experience in conducting focus groups ensured that proper facilitating techniques and procedures were followed by the facilitator (TN). The assistant provided feedback to the facilitator of any necessary changes in the facilitating process for continuous improvement in the facilitating technique. Furthermore, notes taken during the focus groups and reflections made after the focus group allowed the facilitator to monitor various collection targets and data quality.

Focus group procedure

One week before the scheduled date of each focus group, introductory letters providing more details on the focus group were emailed to the interested participants (by TN). These emails provided further information on the focus group including: purpose, location, time, directions etc. The focus groups were conducted at the Ottawa Hospital Research Institute, located at the Ottawa Hospital Civic campus, within the months of October to November, 2010.

On the evenings of the focus groups, informed consent was obtained from each participant prior to the start of the focus group discussion. All focus groups were conducted in English and moderated by a facilitator (TN) with an assistant (KHH). The facilitator explained the aim of the focus group, the role of the facilitator, and the estimated length of the overall discussion. During the focus group, an assistant (KHH) took note of the order of the speakers to help the transcription process. Prior to the start of the discussions, the assistant was introduced to the participants and the note taking process was described in order for the participants to feel more at ease with the presence of the assistant. Food was provided to the participants prior to the group discussion. After each focus group, the participants were sent a thank you email and the names of participants who indicated interest in a copy of the study publication were kept on a confidential list.

Each focus group participant was compensated \$70 upon completion of the focus group. The compensation was not mentioned in the advertisements. The participants were only notified of the compensation after the screening process and a confirmation of participation was obtained; hence, those who were interested and participated in the study were not influenced by monetary compensation. The funds required to conduct this study was available through the Canadian Institute of Health Research operating grant “H1N-

104059 Health Systems, Ethics, and Knowledge Translation Research on Implications of H1N1”.

All research materials are kept confidentially as per regulations of the Ottawa Hospital Research Ethics Board. Any direct quotes used in the publications resulting from this study will be presented anonymously with identifying information omitted to conceal the participants’ identity.

Data analysis

Processing and coding of the data from the focus groups took place over several steps. With the participants’ voluntary consent, the focus groups were audio-taped. Completed recordings of the focus groups were transferred daily by the facilitator from digital recorders directly into a password protected computer, which was kept in a locked room with access only to study personnel. All focus groups were transcribed verbatim by an individual external to the study. The transcriptionist personally received the recordings and transcribed the recordings using only the initials to indicate each of the participants. The initials of each participant in the transcripts were then replaced by a unique identification within each focus group based on the H1N1 vaccination status and by the initial order of the speakers. For example, the identification NV1 represents the first non-vaccinator in a specific focus group; V2 represents the second vaccinator in a particular focus group.

The transcript of the pilot focus group was used to train the two coders (TN and KHH) to code utterances using the TDF. The pilot focus group was coded independently by the two coders and the codes were merged into one file. Two research associates (AP and RI) with experience in qualitative research using the TDF provided the training to the coders (TN and KHH). They also verified the coding and provided rationale for the coding process.

Based on the coding of the pilot focus group, a focus group coding guide was created based on the two coders' understanding of the twelve theoretical domains in relation to the vaccination behaviour. The guide included an agreed upon definition of each domain as well as examples and counter-examples of utterances for each domain. The guide was continuously revised based on the coding of the subsequent focus groups. Table 6 presents the TDF and the content of the utterances coded within each domain.

The utterances that were coded under the domains were statements that were attributed to self and indicated factors that influenced an individual's personal decision to vaccinate or not vaccinate with the H1N1 vaccine. The coders' presence at the focus groups enabled a better understanding of cases where it may not be obvious whether the utterances were attributed to self. An utterance can contain more than one belief and can be coded in more than one domain. Since each utterance could be assigned to many domains, there is no total or denominator for the number of utterances coded.

Table 6. Theoretical domains and content of utterances assigned to each domain.

Domain	Content of utterances assigned to domain
1. Knowledge	Any reference to: • knowledge, whether factual or not • explicit evidence or reference to scientific literature • the extent to which participants felt informed or not
2. Skills	Any reference to skills required to carrying out the behaviour.
3. Social/professional role and identity	Any form of self identification with a group of people (whether professional or not) as a reason to accept or decline vaccination.
4. Beliefs about capabilities	Any reference to: • sense of perceived behavioural control over the decision or the behaviour • how hard or easy it was to perform the behaviour • ability to use or control material provided
5. Beliefs about consequences	Any discussion of: • perceived risks associated with the pandemic or vaccination

	- perceived personal consequences or benefits of vaccination or not (both actual consequences that have occurred and beliefs of potential consequences) - perceived consequences or benefits of vaccination (or not) to others including family members, friends, work colleagues (social responsibility) - attitudes towards vaccination (vaccine necessity, effectiveness, in support or against vaccination)
6. Motivation and goals	Any reference to motivation (or lack of) to get vaccinated. Any mention of intention or lack of intention towards vaccination.
7. Memory, attention, and decision processes	Any discussion of: - decision making process when it comes to vaccination (thinking about concrete things) - memories that drove decision making - attention paid to specific factors in decision making
8. Environmental context and resources	Any mention of factors relating to the environment that impeded or facilitated vaccination.
9. Social influences	Any discussion relating to other people's influences towards or against vaccination (reference to groups of people without self-identifying with those groups), or sources of information about vaccination. Any mention of trust and issues relating to trust
10. Emotion regulation	Any mention of personal feelings or emotions driving the vaccination decision
11. Behavioural regulation	Any reference to: - alternatives to vaccination - post intentional factors that impeded or facilitated vaccination - factors that may lead to a change in vaccination behaviour in future events
12. Nature of the behaviour	Any mention of previous vaccination action taken or future action that will be carried out.
13. Other	Any utterances that fit any the following criteria: - lacking clear, direct inference to personal decision to accept or decline H1N1 vaccination - reference to a feeling/thought/belief that occurred post decision making/or post action - recommendations for improvement to the overall pandemic response

General beliefs that summarized the utterances coded within each domain were identified and these beliefs provided an overview of the key factors within each domain that contributed to participants' individual decision to vaccinate or not vaccinate. When a general belief is shown to be cited more than once to influence the behaviour, this may represent a number of separate responses from one unique participant repeating the same belief or can be a number of different participants citing the same belief. For each domain, the number of participants citing the domain was also tallied.

Domains that are relevant to the vaccination behaviour were identified based on one or more of the following three factors. The first was a higher frequency of the utterances within a domain, or higher frequency of participants citing a domain, or higher frequency of beliefs within a domain would all indicate that a particular domain may be more relevant to the vaccination behaviour. Domains that contained conflicting beliefs leading to different decisions about vaccination also lend support to the domains being relevant to the vaccination behaviour. For example, if vaccinators perceived the vaccine to be safe while non-vaccinators did not then beliefs about the safety of vaccines (domain *Beliefs about consequences*) is relevant to the vaccination behaviour. Lastly, if the content of beliefs within a domain strongly provided evidence for or against vaccination, then the domain would also be deemed as important. For example, "*I got vaccinated because I am diabetic*"; this participant self-identified with diabetic individuals (domain *Social/professional role and identity*) who were at a higher risk of complications from illness with the H1N1 virus. A comparison of the domains and general beliefs within each domain for those who accepted and those who declined the H1N1 vaccine was conducted to explore whether a difference exists in the domains and beliefs that influenced the decision making process between the vaccinators and non-vaccinators.

Utterances not coded within the TDF domains was coded using basic content analysis to identify other major concepts embodied in the data that were not covered by the TDF.

Utterances that were coded under the “Other” category were those that:

- a) referred to a feeling/thought/belief relating to the H1N1 vaccine or pandemic but was unrelated to the personal vaccination behaviour,
- or
- b) referred to a feeling/thought/belief relating to the H1N1 vaccine or pandemic but occurred post decision making/or post action,
- or
- c) were recommendations for improvement to the overall pandemic response

Within this “Other” category the utterances were also further categorized into major themes and summarized.

The coding of the five focus groups was conducted by TN and KHH, using the QSR.N.VIVO v9 program. The first focus group was coded independently by the coders and the codes were merged into one file. Kappa scores were calculated by the QSR.N.VIVO program on inter-rater reliability for each of the TDF domain. The QSR.N.VIVO v9 program calculated the Kappa scores based on the exact number of characters coded; hence, the difference of a space or a few words in the coding between two coders can reduce the Kappa value considerably. Furthermore, the free discussion structure of a focus group led to less structured responses making it difficult to have high inter-rater reliability even when the beliefs coded between the two coders are the same. For the remainder of the focus groups, (#2 to 5), TN coded the transcripts while KHH reviewed and verified the coding to improve

efficiency. Any discrepancies between the coders were resolved by a third reviewer (RI or AP).

Results

Participant characteristics

A total of 33 participants participated in the five focus groups. The size of the focus groups ranged from five to nine participants. The characteristics of the participants are presented in Table 7. The majority of the participants were recruited through the Metro, 36% and Facebook, 33%. The age of the participants in the focus groups ranged from 20 to 80 years of age, with a median of 41 years. Of the participants, almost half were under the age of 35, where as 12 % were aged 65 years or older at the time of the focus groups.

Approximately two-thirds of the participants were female (64%). Half (52%) of the participants self-reported having been vaccinated with the H1N1 vaccine and 42% of the participants self-reported as being in a priority group for the vaccine. Each focus group had a mix of individuals who had been vaccinated with the H1N1 vaccines, and those who did not.

Table 7. Characteristics of focus group participants

				Self reported H1N1 vaccination status	
		Counts (N=33)	%	Non-vaccinators (%)	Vaccinator (%)
Self-reported H1N1 vaccination status	Non-vaccinator	16	48.5	-	-
	Vaccinator	17	51.5	-	-
Age groups	20-34	16	48.5	68.8	31.3
	35-49	8	24.2	25.0	75.0
	50+	9	27.3	33.3	66.7
Gender	Male	12	36.4	41.7	58.3
	Female	21	63.6	52.4	47.6
Self reported priority group	Yes	14	42.4	35.7	64.3
	No	19	57.6	57.9	42.1
Recruitment method	Metro	12	36.4	58.3	41.7
	Facebook	11	33.3	36.4	63.6
	Snowball	8	24.2	62.5	37.5
	Public Health				
	Policy website	2	6.1	0.0	100.0

Theoretical domains framework

A summary of the breakdown of the number of utterances coded in the TDF domains is presented in Figure 3. The largest number of utterances was assigned to the domains *beliefs about consequences* and *social influences*. A high frequency of utterances was also coded into domains: *behavioural regulation*; *environmental context and resources*; and *memory, attention, and decision processes*.

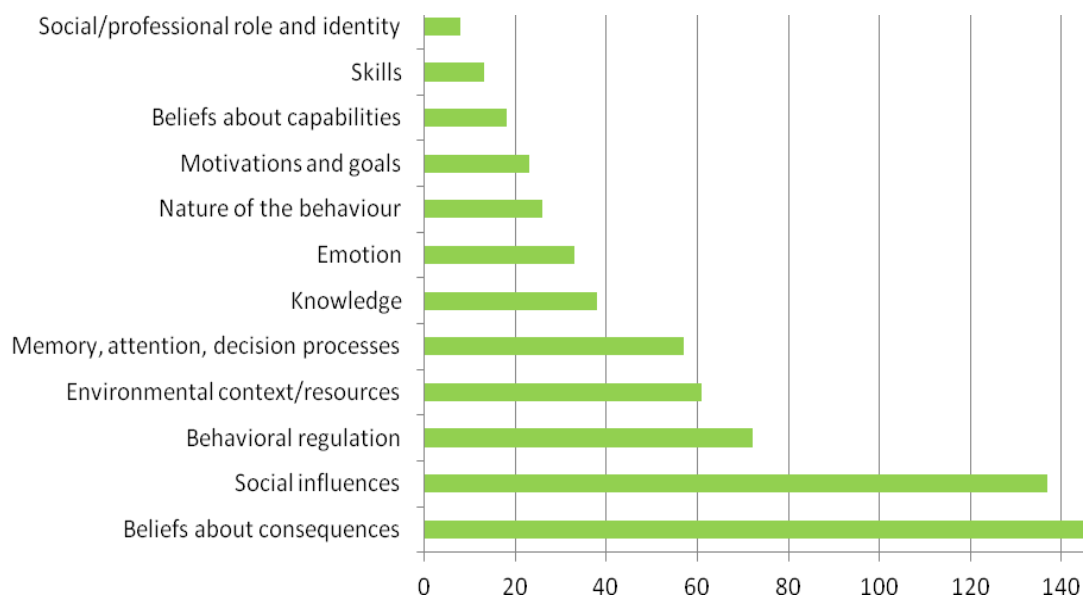


Figure 3. Distribution of utterances assigned in the TDF domains.

Since one participant could provide more than one response related to the same the domain, the absolute number of utterances coded within each domain is greater than the number of participants citing a domain. The numbers of participants who have cited each domain were tabulated and the proportions are presented in Figure 4. The two domains cited by most of the participants were *beliefs about consequences* and *social influences*. Other domains frequently cited by over 70% of the participants include: *environmental*

context and resources; behavioural regulation; and memory, attention, and decision processes.

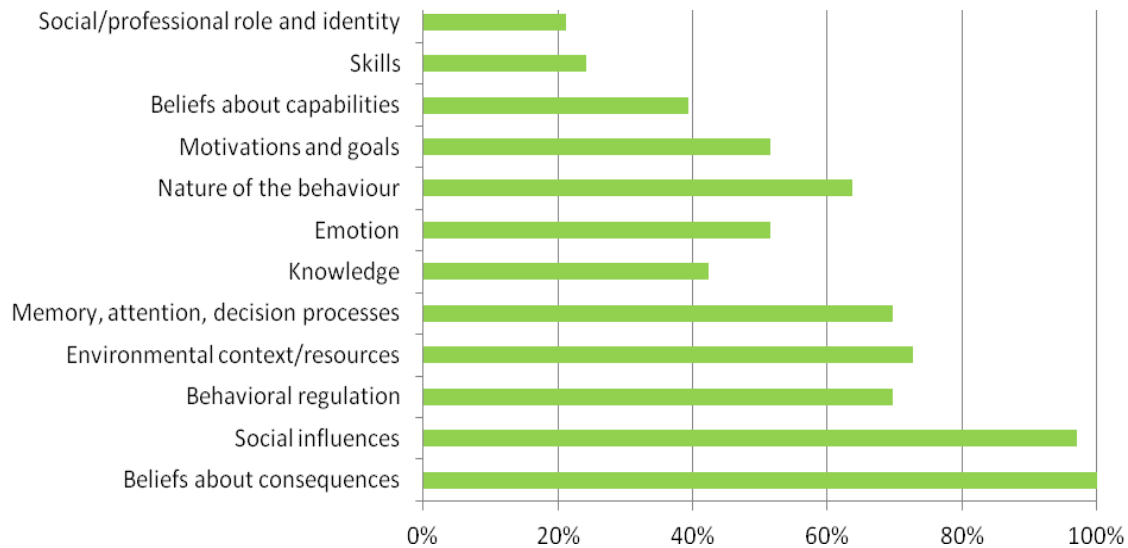


Figure 4. Proportion of participants citing each TDF domain (n=33).

The general pattern of the frequency of utterances coded within each domain (Figure 3) is similar to the proportion of participants citing each domain (Figure 4). The domains *beliefs about consequences* and *social influences* contained the highest frequency of utterances and were cited by most of the participants. A similar pattern can be seen with domains: *environmental context and resources; behavioural regulation; and memory, attention, and decision processes*. These domains were assigned a large number of utterances and at the same time, the beliefs within these domains were discussed by many of the participants; hence, the similarity in the general pattern lends support to the relative importance of these domains to the vaccination behaviour.

Thematic analyses for each domain within the theoretical domain framework are summarized in Tables 8-13. The domains with the highest frequency of utterances and were

cited by over 70% of the participants (*beliefs about consequences; social influences; environmental context and resources; behavioural regulation; memory, attention and decision processes*) are summarized in separate tables (Tables 8-12), with examples of frequently mentioned beliefs within each domain. The number of vaccinators and non-vaccinators are presented for the general beliefs within these domains. Whenever possible an example of responses for those who vaccinated with the H1N1 vaccine and those who did not are presented for each of the beliefs presented. The remaining domains (*nature of the behaviour; motivation and goals; emotion; knowledge; belief about capabilities; skills; social/professional role and identity*) are summarized in Table 13. The examples of responses provided by participants may contain text in brackets that were added for clarity of the statements.

Since a particular utterance may contain more than one belief within a domain the sum of the number of individuals citing each belief within a domain may exceed the total number of individuals citing each domain. For example, the utterance shown below was coded under the domain *beliefs about consequences* and under two beliefs within the domain: beliefs about the effectiveness of the vaccine and beliefs about harms or adverse events from vaccination.

Ex. “*I don’t even know if it’s going to protect me; if it’s going to have any kind of side-effects or you know inadvertent results.*” (NV)

Beliefs about consequences

Beliefs within the domain *beliefs about consequences* were most frequently mentioned by focus group participants. The general beliefs within this domain relate to perception of risks and beliefs about vaccination (Table 8).

During the H1N1 pandemic, participants' perception of personal risk was influenced by the perceived severity of the pandemic. Those who did not vaccinate with the H1N1 vaccine felt that the severity of the pandemic was exaggerated, or there were not many deaths resulting from the outbreak. Conversely, people who were vaccinated cited the following as reasons that caused them to perceive the pandemic to be severe enough to warrant vaccination: the increasing number of sick persons, or reports of healthy people with severe consequences from illness.

Participants also cited perceived risk of being infected by the virus as an important factor to consider in the decision. Non-vaccinators cited their young age or good health status as reasons contributing to the perception of not being at risk of being infected by the virus; hence, a lack of need for vaccination. Adding to the perception of risk was the perceived severity of consequences to one's personal health due to illness. Participants with underlying conditions such as diabetes or respiratory diseases were worried about consequences to their health if they were to become ill from the H1N1 virus, hence were motivated to get vaccinated. Interestingly, people were also concerned about the consequences of being ill and posing a risk to other people, such as people with a weaker immune system. This concern evoked participants' sense of social responsibility to get vaccinated and this reason was cited more by those who vaccinated with the H1N1 vaccine as a facilitator of the behaviour.

Table 8. Summary of beliefs and representative responses coded in theoretical domain *beliefs about consequences*.

Beliefs	Sub-beliefs	# of participants (n=33)	# of NV	# of V	Representative response
Risk perceptions	Severity of public health event	15	8	7	NV- I don't know really if this is a pandemic. I don't know if this is really an issue. V-...I had seen some very active and very healthy people nearly die that should never have gotten this sick with a regular flu so I knew it was quite dangerous out there
	Adverse events/harm from vaccine	13	10	3	NV- I don't even know if it's going to protect me; if it's going to have any kind of side-effects or you know inadvertent results. V-Well why should I get this I don't know if it's going to cause dizziness, nausea you know nosebleeds or whatever.
	Social responsibility	11	2	9	NV- Yeah I had no one else in my life that it would be affecting so I didn't have any other factor other than me. V- Emotionally I have coworkers and like I said their immune systems have been compromised and emotionally I didn't want to feel responsible for making them sick.
	Severity of personal consequences from illness	9	7	2	V- My asthma is very bad and if I get a chest cold I'm in real distress so I had no choice but to get the vaccine. I couldn't afford the chance of getting the flu. NV- I don't have any other known underlying conditions so I didn't think that if I did get it I would get too sick and hopefully I wouldn't die from getting it so.
	Risk of infection	8	2	6	NV- I went well to me I consider myself healthy, any asthma aside, I think I'm healthy. I don't see my risk as sufficient or my risk of exposure as all that excessive either so I said that's what I'm going on

V- I had to get it because if I don't get flu shots I get flu. My experience teaching school is the 2-3 years I didn't get shots I got sick and the years I got shots I didn't.

Vaccination beliefs	Vaccine effectiveness	15	6	9	NV- I guess there were 2 factors; the one was that it was a new vaccine. There's no history of how successful it was V- I got it because I've had the flu shot since they came out and I've never had the flu.
	Past experience	11	6	5	NV- My #1 was the fact that the year prior to H1N1 when I had to get the flu vaccine, like I mentioned that winter I had—that winter I was more sick for longer periods of time and worse than I had ever been as far back as I can possibly remember
	Anti-vaccination attitude	8	7	1	NV – I don't believe in vaccinations.
	Vaccine necessity	7	4	3	NV- And that to me is completely wrong because it's the person who needs it that should be taken care of not the person who doesn't need it like it doesn't make any sense to me in my head. V- I would agree with that. I am also not anti-vaccination. I get the ones when I travel but the optional ones when I'm in Canada I usually wouldn't get.
	Acceptance of previous vaccination	6	0	6	V- I grew up in Asia and basically we jumped on any medication and any vaccination even if we had to pay for it and that's just the way it is because everybody just gets vaccinated so you are safe and we don't think about the facts, which sometimes I do wonder about.
	Vaccine supporter	4	2	2	NV- I'm a big believer in vaccines
					V- I'm very much for human vaccines and that's part of my work also because I'm involved in community development and also trying to raise awareness about vaccines especially in HIV and AIDS vaccines.

NV: non-vaccinator V:vaccinator

An important factor that deterred many from getting vaccinated was the perceptions of risks relating to vaccination due to the lack of research available on the potential side-effects of vaccination with this novel vaccine. Non-vaccinators were not only worried about immediate adverse events that may occur immediately after vaccination, concerns about long-term consequences were also cited as barriers to vaccination. Perception of harms or adverse events associated with vaccination were more frequently cited by non-vaccinators as barriers to H1N1 vaccination.

Participants' beliefs towards vaccination and the H1N1 vaccine was another important group of factors that dominated discussions. Beliefs about vaccination consisted of core beliefs against or supporting vaccination, past experiences with vaccines, and beliefs about the effectiveness and benefits of vaccines. Core beliefs held by some participants about vaccines were influential in the H1N1 vaccination behaviour. Some non-vaccinators carried persistent negative beliefs against all vaccines, and these beliefs inhibited the vaccination behaviour. Among the reasons cited against vaccination included a strong belief in letting the body fight against illnesses naturally. On the opposite side of the spectrum, some vaccinators fully supported vaccines and frequently cited past experience with other vaccines as reasons to vaccinate against H1N1. Personal experience with illnesses, or experience with family members being ill due to vaccine-preventable diseases such as measles were strong motivators towards vaccination. Participants who have accepted previous vaccinations were also less critical of new vaccines, especially those who were regularly vaccinated against seasonal influenza. For individuals with more flexible beliefs about vaccination, the decision to accept or decline a new vaccine such as the H1N1 vaccine depended on the context of the public health emergency.

Social influences

The influence exerted by other people or organizations on the decision to vaccinate during the H1N1 pandemic was discussed in all focus groups and by most participants. Family and friends, healthcare professionals, public health messages and social networks were the commonly cited sources of influence (Table 9).

Healthcare professionals were the source of information and the influence most frequently cited by participants. Participants who vaccinated with the H1N1 vaccine tended to trust and look towards their physicians for advice about vaccination. They frequently cited having received a recommendation for vaccination by their doctor as a reason to get vaccinated. Among those who did not get vaccinated, some also consulted with their healthcare professionals and were advised against getting the vaccine. Some healthcare professionals did not advise for or against the vaccine, and participants in this situation ultimately had to come up with their own decision about the H1N1 vaccination. Not all participants trusted and consulted with their healthcare professionals; the reason cited for not doing so included a lack of trust in the medical profession.

The stories and information distributed through media resources during the pandemic reached many of the participants. Media resources mentioned by participants include local sources such as CBC news (radio and television), the Globe and Mail, the Metro and 24 newspapers. Both vaccinators and non-vaccinators obtained information from the media and some participants cited the media as having influenced their vaccination decision. However, a number of participants were more sceptical of information presented by the media and did not consider information from media sources in the decision making process.

Table 9. Summary of beliefs and representative responses coded in the domain *Social influences*

Beliefs	# of participants (n=33)	# of NV	# of V	Representative response
Influence by healthcare professionals	21	7	14	V- I certainly as I said my GP had recommended it because I get a regular flu shot and then he said well you should get the H1N1. NV- I had to, I always talk to my doctor first about anything... NV- And how many times do you hear of someone getting a prescription and when they get to the pharmacist he/she says you shouldn't be taking this...which also causes us to question a little bit when a doctor tells us take a flu shot.
Influence by the media	19	10	9	NV- Like I could not see any rationale from any of the media sources that gave me grounds to believe there was a reason for it. V- The media also played a big role in our decision making. They stirred things up and we are all scared and it was the same for all of us that people were dying.
Influence by public health messages	17	9	8	V- ...one of the factors was the website because I was on the website every day and I saw the numbers going up like the number of cases. NV- A government education campaign like that trying to convince me of the benefits of getting a vaccination I still sit back and go on my own biases.
Influence by social networks	11	9	2	NV- (What are your influences?) Like it's honestly just people around me. V- The reason why I got myself vaccinated is not so much the science or any of that although I do believe in it but it's more as a culture thing.
Influence by friends/family	10	4	6	NV- But I did look into it and I talked to like my parents and you know my doctor. My doctor told me I didn't have to get it and that was just another reason not to do it. V- I think that's a good point like I mean none of my friends really got it either because we're all from that same demographic so I mean you are influenced by the people around you they do help with your decision-making process.

NV: non-vaccinator, V: vaccinator

Public health websites from the federal to local level were frequented by participants. Public health messages were cited as a trusted source by some participants for information on priority groups and updates on the pandemic. However, not all participants trusted public health information provided by the government. Without trust, the government lacks influence on the public's decision relating to emergency vaccination.

Interactions with family, friends, and social networks were important sources of influence on the decision to accept or decline H1N1 vaccination. Many participants consulted and involved their family members in the decision making process. Friends and social networks also influenced participants' awareness and knowledge of the pandemic and vaccine. Knowing people who are at risk of severe complications from illness with the H1N1 virus also influenced some participants in the decision to get vaccinated. However, there were some individuals who cited a lack of any social influences on their decision towards the H1N1 vaccine.

Environmental context and resources

Issues associated with the delivery of the H1N1 vaccine were barriers frequently cited by participants from all five focus groups (Table 10). The organization of the vaccination clinic, availability of the vaccine, and accessibility to the clinics were important factors that influenced the vaccination behaviour.

There was an agreement among many of the participants relating to the disorganization of the vaccinations clinics. Participants were further deterred from vaccination with long line ups in the cold weather and many agreed that the vaccine delivery

Table 10. Summary of beliefs and representative responses coded in theoretical domain *environmental context and resources*.

Beliefs	# of participants (n=33)	# of NV	# of V	Representative response
Lack of organization in vaccination clinics	10	4	6	NV- That was my first thought you are doing it at a community centre there is no way I'm going to a community centre and you know line up with potentially sick people like you say. V- That was one of the factors from kind of early on as I kind of thought of queuing in the rain and the cold sort of at least 4 hours and then be sick as a dog by the time I get to the front of the line just didn't make any sense.
Availability/ access of vaccine	9	2	7	NV- I don't even have to look up where to go I just have to get in my car and go (other vaccines), but here (H1N1 vaccine) I had to look up where do I have to go, what do I have to do? V- Like I never get vaccinated for the seasonal flu right but I went out and got vaccinated for this partly because of all the coverage and also because it was convenient that it was there when I went to the doctor.
Physical resources	6	5	1	NV- I guess for me when I think of being a newcomer to Quebec I had no physician....so I had no resource to go to. NV- Two reasons why I didn't end up getting it and the first one was time.
Work requirement	4	0	4	V- So I never get the flu vaccine and I actually only got the H1N1 because I had to. At a place where I volunteer I was required to get the vaccination but otherwise I probably wouldn't have gotten it.
Vaccine development	3	3	0	NV- But I think when you see something developed that quickly you start to say "oh wait a minute".

NV: non-vaccinator; V: vaccinator

process was poorly executed. Due to the perceived lengthy wait time for vaccination at the clinics, there were participants who wanted to get vaccinated but opted to wait. Ultimately, some of those who waited did not end up getting vaccinated due to personal time constraints. There were some participants who cited having easier and faster access to the vaccine through vaccination clinics set up at the workplace or university campuses as an important facilitator of H1N1 vaccination.

Some participants cited a lack of information resources, such as having a family physician or having readily available information on the H1N1 pandemic and vaccine, as an important barrier in their decision process. Others cited not having access to research resources, such as the internet to search for more information, as among the reasons for not getting vaccinated with the H1N1 vaccine.

Behavioural regulation

Utterances assigned in the domain *behaviour regulation* are those that referenced factors that contributed to the regulation of an individual's vaccination behaviour. These factors included: alternatives to vaccination, factors that changed an individual's initial intention, and factors that may impact or would be considered in a future decision (Table 11).

Preventative measures, such as hand washing and staying home if sick, were cited as alternatives to getting vaccination. Participants who strongly believed in the effectiveness of these alternative measures were not vaccinated against H1N1.

Table 11. Summary of beliefs and representative responses from theoretical domain *behavioural regulation*.

Beliefs	Sub-beliefs	# of participants (n=33)	# of NV	# of V	Representative response
Forming alternatives to vaccinations		3	2	1	NV-.. You know wash your hands, don't shake hands, don't sneeze on people you know just general preventative measures I thought would be good enough.
Change in intention during the pandemic	Environmental context	8	3	5	NV- I remember being, I remember thinking 'oh my God I have to go get this, it's September this is coming out' but I wasn't in the high risk group ...so I didn't get it then and plus I remember driving by one of the line-ups and I think it wrapped around a building 3 times ...so I decided not to stand out in the cold and wait for it.
	Social influences	2	0	2	V-....actually one thing that struck me and one of the reasons I sort of changed my mind initially was the young hockey player that died in Toronto.
Facilitator of future vaccination	Social influences	16	8	8	V- So yeah once again if my friends had been more convinced (on H1N1 vaccination) maybe they would have influenced me. V- (If a similar situation was to happen this winter let's say you know in the next 2 weeks what would you do?) I would trust my doctor
	Environmental context & resources	13	8	5	V-I think I'd pay attention to whatever was coming by and I think I would check in with my doctor. I think that's what I'd do and then weight it up and decide what to do next. NV- Yeah I would think about it. I'm not yes or no. I would have to deal with the actual context of the situation (future pandemic) I think.
	Beliefs about consequences	7	4	3	NV- I think if I'd thought that it would help me against the next outbreak I probably would have gotten it NV- So yeah like I said earlier it would be the severity and the perceived risks that convince me to change my mind but I don't feel I'm at risk to I can wait.
	Knowledge	7	5	2	NV- Yes. And statistics, substantiated; evidence not just dead bodies.

NV: non-vaccinator; V: vaccinator

Some participants changed their initial intention towards vaccination due to a variety of factors including environmental factors and the influence of people around them. Some participants who initially wanted to get vaccinated had to wait because they were not in a priority group for the vaccine. Other participants cited the long line ups as the reason to wait for vaccination. Unfortunately, some of the participants who waited ultimately did not get vaccinated. Conversely, there were some participants who did not plan to get vaccinated, yet they ended up getting vaccinated because of having quick access to the H1N1 vaccine. Another factor that was influential in the change in some participants' decision to vaccinate was hearing of stories about patients who ultimately passed away after falling ill with the H1N1 virus.

When the participants were queried about factors that would impact vaccination in a similar future public health event, participants cited other people's influences, context of the situation, beliefs about risks and benefits, and new knowledge as factors that may result in a change in their vaccination decision. In future public health emergencies, many participants would continue to rely on their physician for information and advice about vaccination, and many would prefer for their doctor to deliver the vaccine in a future emergency event. The perception of one's personal risk influenced the vaccination decisions during the H1N1 pandemic and was cited to be an important factor in the decision to vaccinate with a future pandemic vaccine. Participants would consider the severity of the public health event and perceived risks before accepting future emergency vaccination. Other participants would also consider information on the vaccine, its components, and potential adverse effects associated with vaccination in their decision to adopt a future pandemic vaccine.

Memory, attention, decision processes

The decision making process was different for each participant (Table 12). For some participants their decision about H1N1 vaccination was automatic. These participants immediately knew their decision for vaccination without having to go through a decision process. For some participants, the answer was an automatic “no” for the H1N1 vaccination and any other new vaccines. On the opposite end of the spectrum, it was an automatic “yes” towards H1N1 vaccination for others.

A greater number of participants went through a thinking process in which different factors were considered in the decision about the H1N1 vaccine. Some were hesitant, some were back and forth in their decision, and others took their time in making their decision. The decision process involved thinking about a variety of factors including one’s personal risk, one’s current health status, potential adverse events associated with the new vaccine, and the context of the pandemic. For some participants, the decision process was further influenced by other people in their life. Participants also considered discussions with their physicians while others considered their children in their decision. Participants remembered and factored into their decision stories of cases of H1N1 infection, as well as information provided on the high risk populations and about the vaccine.

Other theoretical domains were discussed across the focus groups but with less frequency and by fewer of the focus group participants (Table 13). However, the beliefs identified within some of these domains are still relevant to the vaccination behaviour because the content of these beliefs clearly identified specific barriers or facilitators of the behaviour.

Table 12. Summary of beliefs and representative responses from theoretical domain *memory, attention and decision processes*.

Beliefs	# of participants (n=33)	# of NV	# of V	Representative response
Decision processes	21	13	8	NV- like the effects, how long like my brain just said okay there's just too much chaos around this because I know with a flu vaccine you have to get it every year so with H1N1 would I have to get it every year? That wasn't clear and I don't get the flu shot so then why would I get this and then not get it in the following year right. So there was that aspect of it that I thought was but then again you know I had kids so I really, really should get them vaccinated. V- I'm too selfish. No I just knew from the get go I was going to get it. NV- I don't know I started thinking about my decision to take the shot when the media sources starting printing media and started throwing Mexico and the Mexican story.
Attention	9	6	3	V- If something society tells you I really think you better pay attention to this or this is something you need to wake up and read more about or whatever and those are the kinds of things that affect me in my decision-making. NV- Well if he could die then anybody could die and I remember that really stood out.

NV: non-vaccinator; V-vaccinator

Knowledge

Focus group discussions demonstrated that for some participants a lack of overall knowledge relating to the pandemic and the pandemic vaccine contributed to wariness towards vaccination. Participants mentioned a lack of information on the consequences of illness, a lack of information about the composition of the vaccine, and/or a lack of research evidence on the safety of the H1N1 vaccine made it difficult to accept it. Further to the lack of concise information, there was an agreement among participants that conflicting information reduced the sense of necessity for vaccination.

Emotion

The pandemic also stirred up many emotions in the focus group participants. Fear or worries were the most commonly cited emotions. For some participants, fear of risks to oneself from the H1N1 virus facilitated the decision to vaccinate. Others cited confusion around the priority groups setting as a barrier to vaccination.

Motivation and goals

During the pandemic, a sense of need for the H1N1 vaccine facilitated the decision to vaccinate. There were more non-vaccinators who cited a lack of necessity and conversely, there were more vaccinators who cited a need for the H1N1 vaccine.

Social/professional role and identity

Within the general public, identification with a group of people who are at a higher risk of complications or at a lower risk of complications from illness with the H1N1 virus was a factor important to a few participants in the vaccination decision.

Nature of the behaviour

When asked what their decision would be if a similar public health event were to happen within the next two weeks, over half of the participants who responded cited that they will make the same decision. Those who responded that they may change their decision would do so based on the context of the public health emergency and considerations for other factors such as recommendations from their physician.

Beliefs about capabilities, and Skills

The domains *beliefs about capabilities and skills* are less relevant to the vaccination behaviour. The participants did not refer to beliefs in their capability to get vaccinated as a predictor of vaccination. *Skills* was another domain less relevant to the vaccination behaviour since there is no set of skills that directly links to performing this behaviour.

Table 13. Summary of representative responses from theoretical domains: *knowledge, social/professional role & identity, beliefs about capabilities, motivation & goals, emotion, and nature of the behaviour.*

Domain	# of participants (n=33)	Representative response
Nature of the behaviour	21	NV- I would take the same steps I don't know if I would come to the same decision but I would take the same steps to come to the decision and if it was you know a similar case then I would make the same decision.
Motivation and goal	17	NV- But in terms the specific H1N1 vaccine though I personally didn't feel the need to get it because I've had the flu in the past and I have been bed-ridden for a couple of days and it wasn't the end of the world I survived. V- I felt like I needed to get vaccinated
Emotion	17	V- In my case because I've had the flu and I know how sick I'm going to get or make someone so I'm very scared of the flu and I had also that I was young and healthy I know that but it's 5 days of awful illness of being extremely ill and losing your breath and all that so I don't want to get any or do that again so whatever they have I'll take it.
Knowledge	14	NV- It was a shot that I did not know what it did, I did not know how it was made, I did not know how it came to be and why it was being produced in such massive quantities and given to everybody. NV- When you read those different opinions too then you say well where's the necessity?
Beliefs about capabilities	13	NV- I could have had the shot if I wanted it but I didn't want it so I never got it. V- It wasn't a difficult decision.
Social/professional role & identity	7	NV- Well for myself and some others I know we are considered I guess highly sensitive to a lot of chemicals and natural materials so for me I'm very cautious when it comes to taking any vaccination V- I'm asthmatic and I knew I had to be vaccinated

NV: non-vaccinator; V-vaccinator

A comparison of vaccinators to non-vaccinators

A clear difference exists between the main factors that influenced the decision of vaccinators and those that influenced non-vaccinators about H1N1 vaccination. The main differences were summarized by general beliefs within the domains: *beliefs about consequences, social influences, and environmental context and resources* (Tables 8-10).

The influential factors frequently cited by those who choose not to vaccinate with the H1N1 vaccine included: perception of risks associated with vaccination, perceived low consequences associated with illness, anti-vaccination attitude, influence from social networks, and lack of resources. There were three times more non-vaccinators who cited the perception of harm and adverse events from vaccination as a barrier to getting vaccinated compared to vaccinators. A lack of evidence on vaccine safety and a lack of knowledge on the long term effects of vaccination contributed to the negative perceptions of vaccination. Perceived low consequences associated with illness was another reason more frequently mentioned by non-vaccinators as the reason to decline H1N1 vaccination. When asked to talk about factors that influenced their decision, some non-vaccinators cited their overall tendency to not vaccinate as a reason for not considering the H1N1 vaccine. Social networks were cited as both influential and non influential on the vaccination decision for non-vaccinators. Another common barrier to vaccination cited by non-vaccinators was a lack of resources including lack of access to a family physician for advice, lack of access to general information resources about vaccination, and personal time constraints.

Participants who vaccinated against H1N1 frequently mentioned different factors to be important in their decision, compared to non-vaccinators. These are: social responsibility, perceived risk of infection, acceptance of past vaccinations, perceived effectiveness of

vaccination, influence from healthcare professionals, easy access to vaccination, and work requirements. The number of vaccinators who cited a sense of social responsibility as a factor that motivated vaccination outnumbered that of non-vaccinators. Vaccinators believed that getting vaccinated will not only provide personal protection against H1N1 but also protection for others. More vaccinators also cited feeling that they were at higher risk of being infected to be an important consideration in the decision to vaccinate. Vaccinators who have been vaccinated in the past against seasonal influenza and other diseases mentioned being used to getting vaccinations as a reason to get vaccinated with the pandemic H1N1 vaccine. Perception of the effectiveness of vaccination in preventing disease was another belief cited by vaccinators to vaccinate. Compared to non-vaccinators, twice as many vaccinators cited receiving advice from their healthcare professionals as an important influence for H1N1 vaccination. Environmental factors were also cited by vaccinators to influence their decisions. These factors included having easy access to vaccination and having to get vaccinated due to work requirements.

Utterances not coded in the TDF

The utterances that did not clearly indicate whether a predictor was related to an individual's vaccination behaviour were coded into themes aside from the TDF domains. These themes also encompass utterances that reflected beliefs about the H1N1 vaccine or the pandemic that occurred after the behaviour has been executed, or utterances that referenced recommendations for improvement to a future pandemic response.

The number of utterances coded within each of the themes and the proportion of participants who commented on these themes are presented in Figure 5 and 6. There were many utterances that referenced recommendations for improvements to the overall response

in future pandemics, and these recommendations were mentioned by over 90% of the focus group participants. The pattern of the distribution of the utterances within the themes is also mirrored by the number of participants citing these themes.

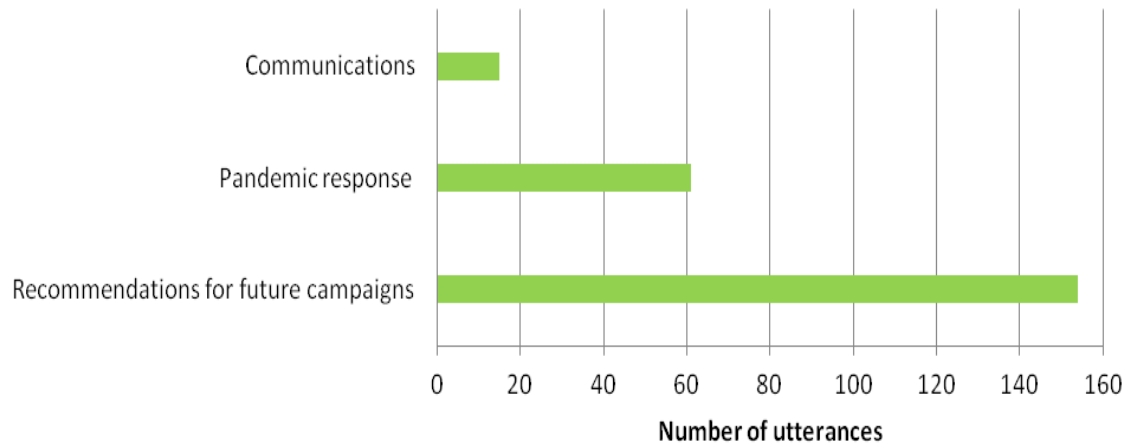


Figure 5. Distribution of utterances not coded into the TDF.

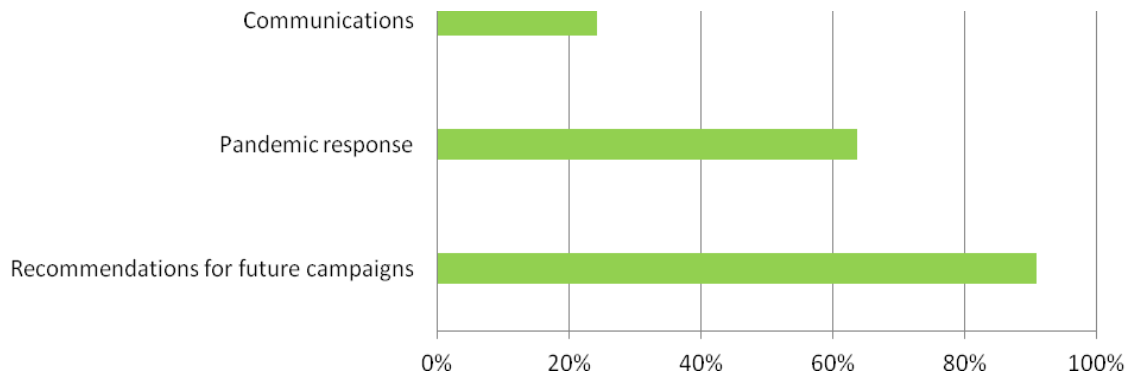


Figure 6. Proportion of participants citing themes not coded in the TDF (n=33).

Themes derived from utterances not coded in the TDF are summarized in Table 14 and Table 15.

Public health response to the H1N1 pandemic

Feedback about the overall public health response to the H1N1 pandemic was provided by more than 60% of the participants (Table 14). Some participants felt that the pandemic response was politically driven or business driven, and less focused on the health of the population. Participants felt that the federal government lost trust and credibility in their leadership role during the response to the pandemic and these elements have to be rebuilt.

Many felt that the public health response lacked consistency across the country as a result of a lack of coordination among the different levels of government. Some participants felt that public health organizations over-reacted in the response to the H1N1 pandemic relative to the (perceived) low severity of the pandemic. Despite all of the criticisms on the public health response to the pandemic, some participants felt that overall the public health response was good and was successful in minimizing the impact of the H1N1 virus.

Participants were also in agreement on the criticisms about the communication process during the H1N1 pandemic. Communication between public health authorities and the general public was cited to be inconsistent, with too much conflicting information. Some participants mentioned having difficulties determining reliable and accurate information from among the plethora of information available.

Table 14. Summary of themes and representative responses from analyses of utterances related to the overall response to the pandemic.

Themes	# of participants (n=33)	Sub-themes	Representative response
Public health response to pandemic	21	Vaccination campaign was a political issue	V – I also found it troubling though not surprising that it also became a very politicized issue ...it kind of became a ball in the political forum when you know people were trying to do their jobs and get people vaccinated
		Public health organizations lost credibility	NV– The credibility is gone all together.
		Inconsistency in public health response	V- ...you can just in this province alone you can see very different approaches taken in Ottawa versus what was happening in Toronto, what was happening in London ...I felt this wasn't really dealt with in a true national emergency situation. NV – I think it was just too many hands in the pot and not enough coordination on the planning and the flu pandemic is just one example of that
		Over-reaction to pandemic	V- All I'm saying is that I think the perception out there among a lot of people is that we overreacted. If we want to be cautious next time we have to have some better data.
		H1N1 pandemic dealt with as best as possible	NV – I feel pretty good about healthcare. I don't think that there could have been anything better done. V- So anyway just to say I think that you know wrapping up on kind of a positive note I think the city did as good a job as it could possibly have done.
		Response to H1N1 was not done well	V –...the program led to a lot of confusion and as we sit here we can't recall what the exact process was or where it failed, where it succeeded, how it worked I think that's a fair statement.
Communications	8	Lack of communication from public health	NV – Wasn't there a problem though with the communication from the Health Ministry in conjunction with the over-abundance of misinformation that the media puts out. So the Health Ministry just needs better communications experts.

authorities

Lack of consistency
in public health
messages

NV- That was one of the other things I found difficulty with was that there were different levels. There was the city person, there was the province person, then there was the national person.

NV: non-vaccinator; V: vaccinator

Recommendations for future emergency vaccination campaigns

The recommendations for future vaccination campaigns provided by the focus group participants pertained to: improving the overall public health response, improving the delivery of the vaccine to the public, and better communication with the general public (Table 15).

Suggestions to improve the overall public health response for future pandemics included having a national response that is consistent and coordinated among all three levels of government. Participants also suggested that improvements to the emergency preparedness measures should be implemented as soon as possible in order to ensure that quick and effective response measures are in place for future pandemics.

Many participants felt that the overall acceptance of H1N1 vaccination would be higher if access to the vaccine was easier and faster. Suggestions to improve the delivery of the vaccine included providing vaccination through existing resources or infrastructure. A frequently cited suggestion was to involve primary healthcare providers in the delivery process. Other suggested methods to facilitate the delivery of vaccines to the general public included vaccinating children at schools and setting up vaccination clinics in community centres. Improving the prioritization system and addressing populations that are at higher risk of complications quickly and efficiently were other factors associated with vaccine delivery that can be improved on.

Improvement in communications with the general public was recommended by the majority of the focus group participants. Suggestions provided to improve communications included changes to the content or format of messages, sources of public health messages, and message dissemination.

Table 15. Summary of themes and representative responses from analyses of recommendations for future vaccination campaigns.

Themes	Sub-theme	# of participants (n=33)	Representative response
Vaccine delivery	Use existing resources/infrastructure	10	NV-... organization is important but I think roping into the whole delivery is your personal doctor and the personal healthcare workers can really make a huge difference in people's comfort and access.
	Priority groups	4	V- I would still think there's a better way of sorting out high priority groups than having them queue up for hours. This seems to be nuts, surely there's a better way.
Public health response	Emergency preparedness	5	NV- As I said I think with SARS because, yes SARS was very scary and yes people did die, but when you read the results after it's all over and see why it happened and it was very simple things that could have prevented it. Those are the types of measures that need to be put in place. So you are proactive rather than reactive.
	Consistency	4	V- We should probably override any of this federal/provincial dispute kind of mechanism and make sure that we have a consistent approach right across the country.
	Regain credibility	2	NV- Well I think they (public health) have to get their credibility back.
Communications	What: provide information in different formats	6	V-...making sure the information is in a language you can read and easy to access... definitely making the information available in more languages, English, French all the various languages and especially given Ottawa is so.
	What: clear, concise messages	5	NV- I needed to have an intelligent, well-articulated, clear and concise message on the purpose of it right. There were bits and pieces everywhere. Information about the product, evidence-based information about the research that they need to say it's safe
	What: risks and benefits of vaccination	4	NV- I found that all the information was vaccinate, vaccinate, we're all going to die you need to vaccinate.... So I guess it's that both sides need to be presented instead of just this blanket statement to go and get vaccinated.

Communications	How: targeted messages	7	V- I think there is a certain population that is going to be a lot harder to reach...so I think that's a really key issue to look at how do you reach that maybe 15-20% of the population that are that hard to reach?
	How: coordinated, consistent messages	6	V- I've really almost given up on that but there has to be some leadership that and leadership again really is concerned with making sure that there is a consistent message that's conveyed to the population about what it is you know what it's risk factors are, what the probability factors are, and things of that nature..
	How: differentiating between rumors and facts	4	V- ... public health officials, government officials have a major responsibility to make sure that the information is being you know bandied about out there is corrected as soon as possible. I don't think that was done very effectively in this case.
Communications	Who: public health authorities	11	NV- You raise a good point about having the key messages right and having it said in layman's terms and I think that would be the Minister's responsibility , but I think having key messages from the other levels of government ,...if we had okay these are the 4 people and we have 3 levels of government and there are 4 people who are giving us our messages at different times during the day
	Who: public health authorities		V- No but a person—the most qualified person the federal minister can find on the subject should be the spokesman and be on television as regularly as possible to give people the facts, all the facts.
	Who: local level of public health	6	NV- But I think it is the case because people in rural Manitoba are going to be affected a lot differently than people in downtown urban Toronto and that goes back to having your local person who has a much better grasp of the situation and the burden of disease and the transmission of disease in the local area.

NV: non-vaccinator; V: vaccinator

Participants felt that the content of public health messages should contain both benefits and potential consequences of vaccination instead of a one-sided argument for vaccination. Communications can also be improved by presenting information that is clear, concise, and in a format that is easy to understand. The information should also be provided in a variety of formats to accommodate Canada's diverse population. Other suggestions on how to better communicate with the public included having coordinated and consistent messages delivered across the country in order to reduce or avoid confusion.

Participants varied in their preference as to who should be delivering the public health messages about vaccination. Some participants preferred to have the messages delivered by trusted health officials at the local level who may have a better understanding of the severity of the pandemic within a particular region. Other participants preferred to have public health officials at higher levels to present the information. Despite the disagreement on the source of information, participants agreed that the spokesperson(s) should be public health experts that are trustworthy, reputable, and credible.

Having easy access to accurate public health information was also important to the participants. Suggestions to improve the process of information dissemination included having access to one trusted and consistent source for accurate information pertaining to the pandemic. Better communication would also involve developing strategies to ensure that the public receives accurate information, and strategies to promptly address falsely reported information. Other improvements included targeting messages towards people who are hard to reach; and increasing awareness in visible minorities, lower income groups, younger age groups, and other people who may not be interested in public health issues.

The suggestions not coded into the theoretical domains provided additional information to inform future interventions aimed at changing an individual's vaccination

behaviour. In summary, the main suggestions for a better response in future vaccination campaigns included having a coordinated and consistent response to the pandemic across all three levels of government. Using existing health services and existing infrastructure to facilitate the delivery of a pandemic vaccine were suggestions provided to improve on the overall delivery process. Suggestions to improve public health communications with the public included having clear and accurate messages, delivered by credible sources and that are easily accessible.

Discussion

The goal of the focus groups was to examine the extent to which psychological domains described by the theoretical domains framework (TDF)⁵⁵ could be used to organize issues that individuals within the general public considered in their decision to adopt or decline an ERV, using the pandemic H1N1 vaccine as a case study. Since the focus groups took place after the H1N1 pandemic, we were able to examine factors that influenced the actual (but self-reported) vaccination behaviour rather than factors that influenced the intention to vaccinate.

To date, relatively little work has tried to understand the psychological processes underlying people's decision to accept new vaccines during a public health emergency. The availability of numerous behaviour theories with overlapping constructs makes it difficult to choose a theory that is best suited for the behaviour of interest. The TDF aggregates a range of psychological theories into a set of twelve domains that explain behaviour change, enabling researchers to apply theory without having to choose from a pool of available theories⁵⁵. This research project is the first to apply the TDF to the area of vaccination. Determining the domains that are relevant to the vaccination behaviour may help identify sets of constructs to target in interventions to change this behaviour. The application of theory to inform interventions may also allow public health authorities to better understand why some interventions are more effective than others, and to select and tailor interventions to be more effective in influencing individuals within the general public to change their behaviour^{36, 58, 59}.

Linking TDF domains with behaviour change techniques

The evidence from the focus groups points to a number of important factors that influenced the vaccination behaviour during the H1N1 pandemic. The domains that captured the majority of these factors and appear to be the most relevant to the vaccination behaviour are: *beliefs about consequences, social influences, environmental context and resources, and behavioural regulation*. Factors that are more malleable to change should be targeted in the development of new interventions to change the behaviour³⁵.

Michie's preliminary work to link behaviour change techniques to theoretical domains identified a set of techniques that maybe useful in changing components of the TDF domains⁵⁷. The set of 35 behaviour change techniques was developed from two published systematic reviews. The techniques were mapped onto each theoretical domain based on the effectiveness of each technique to changing constructs within each of the domains. The effectiveness was determined through an agreement between four experts in developing and implementing behaviour change interventions. In the context of vaccination, the process of selecting suitable behaviour change techniques from Michie's work should consider the feasibility of implementing the selected techniques given the contextual constraints⁸³. Behaviour change techniques aimed at changing the vaccination behaviour should be easy to implement to a large population and be flexible to adapt to differences within the Canadian population.

Table 16 summarizes general beliefs identified from the focus groups that may serve as targets for future public health interventions. These beliefs satisfy the following criteria: they generated the most discussion across the focus groups, they are also potentially modifiable, and there exists relevant behaviour change techniques that may be feasible to implement at a national level. The first column indicates the general beliefs identified by

focus group participants to impede the vaccination decision, and the second column indicates the relevant TDF domains. The behaviour change techniques (column 3) are those that are likely to generate change in constructs within the specified domain⁵⁷, and were chosen based on potential feasibility of implementation in the context of mass vaccination campaigns. The recommendations column (column 4) outlines suggestions for what such an intervention might entail.

The evidence from the focus groups emphasized risk perceptions and beliefs about vaccination to be important barriers to the vaccination decision during the pandemic. Participants who did not vaccinate with the H1N1 vaccine reported the following reasons contributing to declining the vaccine: not perceiving the threat of the pandemic to be severe, a low risk of being infected with the virus, and mild consequences associated with being ill. Beliefs about vaccination also impeded vaccination against the H1N1 virus. These beliefs included: perception of short and long-term adverse events from vaccination, and belief that vaccination against seasonal influenza was not necessary to prevent illness in the previous years. Other studies have also confirmed the relationship between risk perceptions and previous vaccination with a seasonal influenza vaccine with pandemic H1N1 vaccination²⁹,

54, 77

Table 16. Description of theoretical domains and modifiable beliefs to be addressed in future vaccination campaigns with suggested behaviour change techniques

Modifiable beliefs	Theoretical domain	Behavioural change technique	Possible implementation of technique
The pandemic was not severe enough to warrant vaccination	Beliefs about consequences	Persuasive communications, information provision	Provide information about the number of cases, the morbidity and mortality associated with the pandemic at a national level and if applicable at the regional level.
My personal risk of infection by the H1N1 virus was low	Beliefs about consequences	Persuasive communications, information provision	Provide information on the risk of infection: • who is at risk • why these people are at risk • magnitude of the risk Present stories of people at risk that the public can relate to.
The consequences of contracting the virus will not be severe	Beliefs about consequences	Persuasive communications, information provision	Provide information on the consequences of illness to oneself and consequences to others: • what are the consequences • severity of the consequences • treatments for illness • persons at risk of consequences Educate the public on the concept of herd immunity and how it relates to the current pandemic. Present stories of people that the public can relate to.
There are harms or adverse events associated with vaccination	Beliefs about consequences	Persuasive communications, information provision	Provide information (and if available evidence) on the benefits and the consequence of vaccination. Present information on: • persons at risk of adverse events • why these people are at risk • magnitude and rarity of serious side effects • benefits of vaccination • comparison of magnitude of risks of pandemic with risks of vaccination

I didn't need to get a seasonal influenza vaccine in the previous years	Beliefs about consequences	Persuasive communications, information provision	Provide risk messages relating to seasonal influenza epidemics and information on the benefits and the effectiveness of seasonal influenza vaccination. Educate the public on the concept of herd immunity.
My healthcare professional did not recommend vaccination	Social influences	Social processes of encouragement, pressure, support; modelling and demonstration of behaviour by others	Provide information about vaccine (both benefits and consequences) to healthcare professionals as soon as they are available. Engage healthcare professionals in recommending vaccination to the general public. Encourage healthcare professionals to model the behaviour.
The line ups to get vaccinated were long and I didn't have time to go get vaccinated	Environmental context & resources	Environmental changes	Use existing infrastructure to facilitate the delivery of vaccines: • have vaccine available in medical clinics as soon as vaccines are available • set up vaccination clinics in similar manner to clinics for seasonal influenza vaccine • deliver vaccine during school hours to children • set up vaccination mobiles in the same manner as blood donation mobiles • set up vaccination clinics at workplaces, in university and college campuses.
I intended to get vaccinated but environmental barriers such as long line up and disorganized vaccination clinics discouraged me.	Behavioural regulation	Planning, prompts	Provide people with information and means to plan an alternative time and location to get vaccinated. Use public health messages to remind people who are waiting for vaccination of the importance of vaccination and encourage these people to get vaccinated.

Risk perceptions and beliefs about vaccination are captured in the domain *beliefs about consequences*. Michie's work⁵⁷ suggests that behaviour change techniques to likely be effective in changing beliefs within this domain include persuasive communications and providing information regarding behaviour and/or outcome. These are behaviour change techniques that would also be feasible to implement at a population level. The focus group participants also provided suggestions to improve communications between public health organizations and the general public. In future public health emergencies, focus group participants indicated that they would like concise and consistent messages from credible and trusted public health officials. These messages should convey clear and detailed information on the risk of infection and related consequences of illness, as well as information on the benefits and consequences to vaccination. Participants also stressed the need to have easy access to the public health messages and the information provided should be in a variety of formats and languages to accommodate Canada's diverse population. These recommendations should be considered in the development of theory-based interventions aimed at altering an individual's perceptions of risks and beliefs about vaccination with future ERVs.

Healthcare providers were cited as trusted sources of information on vaccination for many of the participants. The evidence from the focus groups suggests that recommendations for vaccination by a healthcare professional were important in the decision to vaccinate with the pandemic H1N1 vaccine. The evidence also suggests that recommendations from healthcare providers may change individuals' decision about vaccination with a future pandemic vaccine. Other studies have also demonstrated the importance of recommendations from healthcare providers in the decision to vaccinate against H1N1^{29, 54, 77}, and people who received recommendations from their family physicians were also more

likely to be vaccinated against both seasonal and H1N1 pandemic influenza compared to those without recommendations⁸⁴.

Recommendation for pandemic vaccination from one's healthcare provider falls into the domain *social influences*. Behaviour change techniques proposed by Michie's work to likely bring about change in components within this domain include social processes of encouragement, pressure, and support; and modelling and demonstration of the behaviour by others⁵⁷. Public health officials should consider actively engaging healthcare providers in providing recommendations for vaccination to their patients in future public health emergencies. This can be facilitated by engaging and providing healthcare providers with timely and up-to-date information from the start of the pandemic, so they are prepared when patients seek out personalized guidance relating to vaccination. Healthcare providers should both advocate vaccination to their patients and also be encouraged to model the behaviour to patients. Individuals may be more inclined to personally accept a future ERV knowing that their healthcare providers also got vaccinated with the same vaccine³⁶. Unfortunately, obtaining high vaccination rates amongst healthcare workers (HCWs) remains a considerable obstacle⁸⁵. Intervention components that have been shown to be effective in increasing influenza vaccination in HCWs include: on-site vaccination, lectures about influenza, lectures about benefits and safety of influenza vaccine, leadership support, vaccination campaigns, and mandatory vaccination policy⁸⁵. Overall, vaccination rates have been demonstrated to be higher in hospitals with active implementation of vaccination policies or interventions⁸⁶. In non-hospital health care settings, interventions with combinations of components of education, promotion and improved access influenza vaccination yielded greater coverage among HCWs⁸⁷. Improving vaccination rates in healthcare providers and

involving healthcare providers in mass vaccination campaigns may result in higher uptake of an ERV by members of the general public⁸⁸.

Issues relating to access to the vaccine, such as organization of the H1N1 vaccination clinics and long line-ups, were among the top criticisms mentioned by the focus group participants about the delivery process. Consequently, they were also cited as reasons to not consider vaccination during the H1N1 pandemic in this study and also documented by others²⁹. Issues associated with access and organization of the vaccination clinics are captured in the domain *environmental context and resources*. The effective behaviour change techniques likely to address components within this domain would entail making environmental changes to facilitate the desired behaviour⁵⁷. Changes made to the vaccine delivery process should include providing easier and quicker access to vaccination to help encourage members of the public to get vaccinated. Based on the suggestions provided by the focus group participants, public health officials should consider increasing access to vaccination in future public health emergencies through the use of existing resources. This may include setting up vaccination clinics in community centres, schools, primary care offices, vaccination mobiles, at the workplace, or in universities. Increasing the number of clinics available may alleviate the line-ups and reduce the wait time. Furthermore, less overcrowding at individual clinics may help with the organization of the delivery process. As well, it may enable priority group members to get vaccinated quicker and help individuals not in priority groups, who desire vaccination, have quicker access. Alternative locations for vaccination clinics should be compared to determine the relative contribution of each of these approaches to increasing the ease of access to the vaccine, in order to determine alternatives that will provide the widest access to vaccination to those who need and want it.

During the pandemic some participants intended to get vaccinated with the H1N1 vaccine, but it was the long line-ups that deterred them. Others decided to wait, but ultimately did not end up getting vaccinated because the perceived need for vaccination diminished over time. These issues fall into the domain *behavioural regulation* and may be addressed through behaviour change techniques of planning and prompting⁵⁷. Public health officials should consider providing members of the public with clear, accessible information on alternative locations for vaccination, and the means through which they can book a time to get vaccinated to avoid long wait times. Studies have shown that making a plan with details about when and where the behaviour will take place increases the likelihood that the intended behaviour will be executed⁸⁹⁻⁹¹.

This phase of the project identified theoretical domains that are relevant to vaccination during the H1N1 pandemic and suggested behaviour change techniques that may be effective in changing the barriers within these domains. Research in linking behaviour change techniques with theoretical domains is still in its infancy hence further research is necessary to determine effective techniques for changing specific behaviour determinants⁵⁷, in a specific context. The vaccination decision is complex and is influenced by a combination of facilitators and barriers. Consequently, interventions aimed at changing the vaccination behaviour will likely be complex and will involve a combination of behaviour change techniques to target multiple predictors. The development and testing of interventions to increase the uptake of a vaccine during a public health emergency should involve a multidisciplinary team of researchers, policy makers, and stakeholders. Ideally, effective interventions should incorporate techniques that can be implemented together in a cohesive manner, and are feasible to implement on a broad scale in order to increase vaccination rates across the country.

Limitations

The focus group methodology has several important limitations. For example, the questions within the focus group guide were left open-ended and group interactions were used to generate data ⁶⁰. One challenge of leaving the questions open-ended occurred when the participants spoke in a general manner and do not personalize their utterances to their own behaviour. In some cases, it was difficult to determine if these general statements influenced the speaker's vaccination decision during the pandemic. During the focus groups, it was not possible to interrupt the conversations to clarify all the general statements to determine how they influenced an individual's decision. Another limitation was the possible over-interpretation of the data. In order to avoid this, more general statements were not coded into the TDF but were retained in an "Other" group of utterances for thematic analyses. An in depth examination of this group of utterances by the two reviewers (TN and KHH) suggests that these statements provided broader reflections of the pandemic response. The majority of these statements reflected the participants' perceptions of the overall public health response or recommendations to improve future vaccination campaigns. The data not coded into the TDF suggests more data was generated when the discussions were left open-ended and not targeted to only the predictors of the vaccination behaviour. The additional data obtained from the focus groups is useful to further inform the content of the behaviour change techniques aimed at changing beliefs within domains relevant to the vaccination behaviour. For example, suggestions provided by the participants on how to improve communication with the public may be useful to inform persuasive communication strategies in future public health emergencies. In examining the vaccination behaviour, broader discussions should be allowed and encouraged through the use of focus groups in order to generate data that may otherwise not be discussed.

Some of the focus group participants voiced strong opinions against vaccination and research shows that these individuals are likely to not be persuaded to change their behaviour to accept a vaccine⁹². Another limitation is that the comments provided by these participants may be limited in usefulness for our purpose of identifying barriers that can be addressed in future interventions. As well, within a mixed composition of participants with different beliefs about vaccination, it is possible that participants with stronger opinions may have inhibited or posed communication barriers for minority voices. However, the facilitator sought to ensure that all participants contributed to the discussions, and across the focus groups all the participants provided their thoughts during the discussions.

Another limitation is the lack of representativeness of the data collected to the Canadian population. The participants for the focus groups were all recruited through purposive sampling with the purpose of exploring a broad range of issues relating to pandemic H1N1 vaccination among a small group of individuals, rather than exploring a small set of issues among a larger group that may be more representative of the Canadian population. The small sample size also restricted the research from exploring variability in beliefs within sub-populations in the general public. Further research is necessary in order to inform theory-based interventions targeted to sub-populations that may be more reluctant to accept an ERV. Purposive sampling also may have resulted in the systematic selection of participants for the focus groups. However, the researcher sought to reach the broadest pool potential participants and to sample a full range of views and experiences by using different recruitment methods and broad selection criteria for the participants.

Conclusion

The application of the theoretical domains framework to better understand the decision to adopt or decline an ERV provided insight into the key psychological constructs that underlie this behaviour. The evidence from the focus groups suggests the theoretical domains that are relevant to the vaccination behaviour are: *beliefs about consequences*, *social influences*, *environmental context and resources*, and *behavioural regulation*. Future interventions to improve the uptake of an ERV should be developed to incorporate behaviour change techniques likely to induce a change in the constructs within these domains. These techniques include:

- 1) persuasive communications and information provision to address risk perceptions and vaccination beliefs in the domain *beliefs about consequences*;
- 2) social processes of encouragement and support, and modelling and demonstration of behaviour to address barriers in the domain *social influences*;
- 3) environmental changes to address environmental barriers in the domain *environmental context and resources*;
- 4) planning and prompting to address barriers in the domain *behavioural regulation*.

Implementing theory-based interventions may lead to emergency vaccination campaigns that are more effective in increasing vaccination rates, thus reducing the public health impact of future outbreaks of infectious diseases.

RECONCILING RESULTS FROM THE SYSTEMATIC REVIEW AND THE FOCUS GROUPS

The unique characteristics of an ERV pose a unique set of issues to consider in the decision to vaccinate. These characteristics include: the rapid development, approval, and distribution of an ERV in conjunction with the need for maximum uptake of the vaccine by a large proportion of the population, within a short period of time; sparse evidence on the safety and effectiveness of the vaccine; the rapidly changing information communicated to the general public as new data emerges about the virus and the potential impact of the illness. Challenges in promoting vaccination that may be due to these unique characteristics of an ERV warrant the need to study the vaccination behaviour with an ERV separately from established vaccines.

The H1N1 outbreak was declared by the WHO to be the first pandemic of the 21st century²³, and the pandemic H1N1 vaccine was an important component of primary prevention world wide²⁶. What was apparent from the experience with the H1N1 pandemic was some reluctance within members of the general public to vaccinate with a novel vaccine. This underscores the need for further research to better understand the decision to accept or decline vaccination with an ERV during a public health emergency. This research project employed a mixed methods approach to understanding the multitude of factors that may influence an individual's decision to accept an ERV, using the pandemic H1N1 vaccine as a case study.

A comparison of the beliefs between the systematic review and the focus groups revealed a number of similarities and differences in the predictors found to be relevant to H1N1 vaccination. A complete comparison of predictors of the H1N1 vaccination behaviour between the systematic review and the focus groups is presented in Appendix G.

The focus of future interventions should be on addressing barriers that are potentially malleable^{35, 83} and that will ultimately produce the greatest improvement in the vaccination rate. The evidence from both phases of the project identified consistent barriers of vaccination during the pandemic that are likely to be modifiable in population-wide public health interventions. These barriers are: perceptions of risks, previous decline of vaccination, lack of recommendations by healthcare professionals, and environmental constraints.

The first group of barriers identified by both phases to impede pandemic vaccination relates to the perception of risks. Perception of risks was most frequently identified across studies within the systematic review and also most often referred to by focus group participants. These risks included: perception of the pandemic to be mild, perception of low risk of infection, perception of low risk of severe consequences from infection, and perception of higher risk of harm from vaccination. Modifying an individual's risk perception to perceive higher risks associated with a public health emergency may lead to higher vaccination rates. Future interventions should consider combining messages that increase the perception of risks in conjunction with advices to effectively manage the risks. Recommendations to effectively manage risks will involve promoting vaccination with an ERV. Researchers have suggested that providing risk messages in combination with strong messages about safety and benefits of protective behaviours to manage risks, such as vaccination, may be more effective in producing the greatest change towards the desired behaviour^{79, 93}.

Previous decline of vaccination with other vaccines, particularly the seasonal influenza vaccine, is the second factor identified to be a consistent barrier of both the intention to accept, and the receipt of the pandemic H1N1 vaccine. The evidence from this

project suggests that encouraging individuals to form a habit of getting the seasonal influenza vaccination prior to the next public health emergency may predispose members of the general public to get vaccinated with an ERV, hence increasing the uptake of the vaccine. Future experimental studies should investigate whether interventions to increase seasonal influenza vaccination rates will result in an increase the intention to vaccinate with a future ERV. A meta-analysis of the relationship between intention and behaviour for a variety of health behaviours found that a medium-to-large change in intention leads to a small-to-medium change in behaviour⁹⁴. It is important to remember that even a small change in the vaccination behaviour at a national level may result in many more Canadians getting vaccinated in a future public health emergency.

The evidence from both phases points to the importance of social pressure on an individual's intention to vaccinate and actual uptake of the pandemic vaccine. The most prominent source of social influence on the decision to accept or decline the vaccine was recommendations or lack of recommendations from healthcare professionals. This relationship was consistent across the studies included in the systematic review and frequently cited by the focus group participants as an important source of influence. Public health officials should consider engaging primary healthcare providers to provide recommendations and vaccination early in the pandemic response. Future randomised-controlled studies should be conducted to examine the effects of recommendations for vaccination, as well as modelling of the behaviour by healthcare providers on the intention of individuals within the public to vaccinate with a future ERV.

The main disparity between findings from the systematic review and that of the focus groups relates to the importance of issues associated with access in the decision to vaccinate. Surveys included in the systematic review presented access-related issues such as vaccine

delivery, priority groups, and costs in relation to the intention to vaccinate. These issues related to access was not shown to be consistent predictors of the intention to vaccinate. Conversely, evidence from the focus groups showed that factors related to access were important environmental barriers to vaccination during the H1N1 pandemic. Many focus group participants were deterred from vaccination when they encountered difficulties accessing the vaccine due to long line-ups and disorganization at the vaccination clinics. Future surveys and intervention studies should consider examining a wider range of factors related to access, particularly factors related to the logistics of the vaccine delivery process. Addressing these barriers to ensure a future ERV is easily accessible to all individuals who need or desire vaccination may be a key component in increasing vaccination rates in future public health emergencies.

A number of surveys included in the systematic review found a difference in the intention to vaccinate with the pandemic H1N1 vaccine between ethnic groups. People of non-white ethnicities were shown to be more accepting of the vaccine compared to Caucasian persons. Qualitative methodologies such as focus groups are not intended to examine the association between a variable, such as ethnicity, and the outcome, such as the receipt of the pandemic H1N1 vaccine. However, one focus group participant did cite her cultural background (non-Caucasian) as a reason to accept the pandemic vaccine. The evidence highlights the importance of understanding ethnic and cultural differences in the vaccination behaviour and targeting sub-populations more reluctant to vaccination in future emergency vaccination campaigns.

Developing and testing theoretically driven interventions

The integrated evidence from this research study identified a number of potentially modifiable barriers to target in future interventions to increase vaccination with an ERV. As well, the theoretical approach identified a number of domains that are relevant to the vaccination behaviour. Michie's work suggests a number of behaviour change techniques that are likely to be effective in addressing barriers within these domains⁵⁷, hence may be effective in changing the vaccination behaviour in a future public health emergency.

Based on the results of this study, public health officials should consider developing complex interventions that combine the following theoretically driven behaviour change techniques:

- 1) persuasive communications and information provision to address perceptions of risks relating to the public health emergency and vaccination;
- 2) social processes of encouragement and support, and modelling and demonstration of the desired behaviour by healthcare providers to encourage members of the public to get vaccinated;
- 3) changes to the vaccine delivery process in order to reduce environmental barriers to vaccination;
- 4) mechanisms for planning an alternative time and location for vaccination to help members of the public overcome environmental barriers that they may encounter, and prompting to remind individuals to get vaccinated.

The integrated evidence in this study and findings from other research studies^{29, 54, 77, 95} have also demonstrated that previous vaccination with a seasonal influenza vaccine consistently predicted pandemic H1N1 influenza vaccination. This relationship links the decision-making process for influenza vaccinations⁸⁰ and supports the idea that increasing

seasonal influenza vaccination rates may directly result in an increase in the uptake of a future pandemic influenza vaccine. Ultimately, public health authorities may increase the acceptance of a future pandemic influenza vaccine in the general public by developing and implementing theoretically driven interventions to increase seasonal influenza vaccination prior to the next public health emergency.

Complex interventions to increase vaccination in a future public health emergency would entail targeting not only members of the general public, but also targeting healthcare providers. Public health officials should also consider incorporating techniques to increase provider recommendations for vaccination (providing encouragement and support to patients) and increasing vaccination rates in healthcare providers (behaviour modelling to patients).

The complex interventions to address barriers related to vaccination with an ERV should be implemented as early as possible in a future public health emergency to ensure that the barriers are addressed early on, so they ultimately do not hinder the success of a mass vaccination campaign. The success of a vaccination campaign also relies on ensuring that a high proportion of the targeted population is vaccinated, in order to achieve the herd immunity threshold. The interventions should also be implemented at a population level, yet be flexible enough to accommodate and target sub-populations that are more reluctant to vaccinate with an ERV. Targeting different sub-populations such as healthcare organizations, workplaces, and schools may yield higher vaccination coverage. Prior to the next public health emergency, research studies can be conducted to test the effectiveness of complex interventions combining some as well as all of the suggested behaviour change techniques in randomized control studies. Testing different combinations of behaviour change techniques can help determine the interventions that will be most feasible to

implement and likely to be most effective in increasing the acceptance of an ERV at the population level and within sub-populations.

Another constraint to consider is finding the appropriate context to test the interventions before the next public health emergency since population-wide disease outbreaks do not occur frequently and are difficult to simulate. Public health officials should consider conducting experiments to determine the effectiveness of interventions using a vaccine that has similar characteristics to a future ERV.

The seasonal influenza vaccine may be a good model to test the effectiveness of interventions to increase the acceptance of a future pandemic vaccine when the pathogen responsible for the disease in a future public health emergency is a novel influenza virus. A seasonal influenza vaccine and a pandemic influenza vaccine are similar in a number of ways. First, both vaccines are targeted towards the same group of infectious disease, influenza viruses. Furthermore, the decisions to vaccinate with the seasonal influenza vaccine and the pandemic H1N1 vaccine have been shown in the literature to be influenced by some similar beliefs. Common reasons provided against vaccination for both vaccines include: doubts about vaccine safety⁹⁶, perception of low risk of infection or low risk of complications associated with illness⁸⁰, and lack of recommendations from healthcare providers⁸⁴. The similarities between a seasonal influenza vaccine and a pandemic influenza vaccine lend support to the use of the seasonal influenza vaccine to test the effectiveness of interventions aimed at increasing vaccination rates with a future pandemic influenza vaccine.

Despite the potential advantages of using the seasonal influenza vaccination behaviour as a model for testing interventions to increase the acceptance of a future pandemic vaccine, there are caveats to taking this approach. The main difference between the seasonal influenza vaccine and the pandemic H1N1 influenza vaccine is the context

surrounding the use of each vaccine. The seasonal influenza vaccine is used in a non-emergency context to reduce the impact of seasonal influenza epidemics, while the pandemic H1N1 influenza vaccine was promoted under the context of an international public health emergency. The non-urgent context of seasonal influenza epidemics is a limitation to using seasonal influenza vaccination behaviour as a model for pandemic vaccination behaviour under an emergency context. In an emergency context, when an individual is under the threat of illness or death, the characteristics of an ERV may pose additional challenges to promoting uptake of the vaccine. The rapid process through which the vaccine is developed and be made available to the public, the mass vaccination campaigns to minimize the impact of the disease, and the changing information about the public health emergency and the ERV as the emergency situation progress are characteristics that may influence an individual's reaction to an ERV, hence the impact of the interventions tested under the non-urgent context of a seasonal influenza vaccine may have a different effect on behaviour change when under the context of an emergency. Interventions and communications strategies that are tested using the non-urgent context of seasonal influenza vaccination as a model may not be as effective in promoting vaccination in an emergency context. Another limitation with using the seasonal influenza vaccination as a model is the identity of a future emergent pathogen. If the emergent pathogen implicated in the next public health emergency is not an influenza virus, the interventions developed to target predictors of the uptake of influenza vaccines may not be as effective in addressing predictors specific to a non-influenza ERV. The reaction of member of the general public to an ERV and the vaccination decision process may vary dependant on the identity the disease-causing pathogen, hence interventions that may be effective in increasing vaccination with an influenza vaccine may not be as effective in increasing vaccination with another pathogen in a future public health

emergency. Multiple interventions strategies should be developed and tested to have the flexibility to adapt to the unknown context of a future public health emergency.

CONCLUSION

Vaccination continues to be an essential intervention to protect the health of people worldwide against infectious diseases. Despite the known success of vaccines in preventing and reducing the overall impact of diseases worldwide, some individuals within the general public were skeptical to vaccinate with the 2009 pandemic H1N1 vaccine. The variable success of mass vaccination campaigns during the pandemic underscores the need to understand factors that influenced vaccination with an ERV. This research project is the first to use a mixed methods approach while applying a theoretical lens to examine the vaccination behaviour during a public health emergency. The integrated evidence accumulated through this approach emphasized a number of potentially modifiable barriers that public health officials should consider to target in interventions aimed at increasing vaccination with a future ERV. Based on this work, components of vaccination interventions should include 1) clear messaging around risks of the disease and relatively small risks of the vaccine, 2) improved accessibility to the vaccine through the use of existing resources such as schools, community centres and primary healthcare providers, 3) personal recommendations for vaccination from primary healthcare providers, 4) strategies aimed at increasing acceptance of the seasonal influenza vaccine prior to the next public health emergency, 5) population-specific strategies to target sub-populations who are more reluctant to accept a novel vaccine, 6) a theoretical understanding of the underlying causal pathways and behaviour change techniques known to change them. Incorporating these components into future interventions may result in successful emergency vaccination campaigns with higher vaccination coverage within the general public.

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APPENDIX A. CONSENSUS PROCESS FOR LINKING BEHAVIOUR CHANGE TECHNIQUES WITH DETERMINANTS OF BEHAVIOUR⁵⁷.

Technique for behaviour change	Techniques judged to be effective in changing each construct domain										
	1	2	3	4	5	6	7	8	9	10	11
Goal/target specified: behaviour or outcome											
Monitoring											
Self-monitoring											
Contract											
Rewards; incentives (inc self-evaluation)											
Graded task, starting with easy tasks											
Increasing skills: problem solving, decision making, goal setting											
Stress management											
Coping skills											
Rehearsal of relevant skills											
Role-play											
Planning, implementation											
Prompts, triggers, cues											
Environmental changes (eg, objects to facilitate behaviour)											
Social processes of encouragement, pressure, support											
Persuasive communication											
Information regarding behaviour, outcome											
Personalised message											
Modelling /demonstration of behaviour by others											
Homework											
Personal experiments, data collection (other than self-monitoring of behaviour)											
Experiential: tasks to gain experiences to change motivation											
Feedback											
Self talk											
Use of imagery											
Perform behaviour in different settings											
Shaping of behaviour											
Motivational interviewing											
Relapse prevention											
Cognitive restructuring											
Relaxation											

APPENDIX B. SEARCH STRATEGIES

Database: Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) <1950 to Present>

Search Strategy:

-
- 1 Vaccination/ or Mass Vaccination/ or vaccin\$.tw. (181200)
 - 2 Anthrax Vaccines/ or Smallpox Vaccine/ or Influenza Vaccines/ or (H1N1 or swine flu or H5N1 or avian flu or bird flu).tw. (21236)
 - 3 1 or 2 (189137)
 - 4 Disease Outbreaks/ or (pandemic\$ or epidemic\$ or outbreak\$).tw. (113889)
 - 5 Bioterrorism/ or emergencies/ or (bioterror\$ or emergency or emergent).tw. (146705)
 - 6 4 or 5 (257604)
 - 7 3 and 6 (17661)
 - 8 Attitude/ or attitude\$.tw. (98801)
 - 9 Perception/ or (perception\$ or perceive\$).tw. (174307)
 - 10 communication barriers/ or barrier\$.tw. (114683)
 - 11 "Patient Acceptance of Health Care"/ or (accept\$ or rejection or willingness).tw. (301968)
 - 12 Motivation/ or Intention/ or (intention\$ or motivat\$).tw. (110507)
 - 13 Health Knowledge, Attitudes, Practice/ or "Attitude of Health Personnel"/ (118620)
 - 14 exp decision making/ or (decision\$ adj1 making).tw. (122071)
 - 15 or/8-14 (890811)
 - 16 7 and 15 (1182)
 - 17 animals/ not humans/ (3425576)
 - 18 16 not 17 (1100)
 - 19 qualitative research/ or qualitative.tw. (87357)
 - 20 interview/ or health surveys/ or interviews as topic/ or narration/ or questionnaires/ or Focus Groups/ (299201)
 - 21 (interview\$ or survey\$ or focus group\$ or questionnaire\$ or narrat\$ or experience\$).tw. (1039040)
 - 22 Observation/ or observation\$.tw. (469567)
 - 23 or/19-22 (1613210)
 - 24 18 and 23 (392)
 - 25 from 24 keep 1-392 (392)

Database: EMBASE Classic+EMBASE <1947 to 2010 July 22>

Search Strategy:

-
- 1 vaccination/ or mass immunization/ or vaccin\$.tw. (168265)
 - 2 anthrax vaccine/ or smallpox vaccine/ or influenza vaccine/ or avian influenza vaccine/
(19211)
 - 3 (H1N1 or swine flu or H5N1 or avian flu or bird flu).tw. (6132)
 - 4 or/1-3 (176731)
 - 5 epidemic/ or (pandemic\$ or epidemic\$ or outbreak\$).tw. (89724)
 - 6 biological warfare/ or (bioterror\$ or emergency or emergent).tw. (116221)
 - 7 5 or 6 (203711)
 - 8 4 and 7 (15798)
 - 9 health personnel attitude/ or nurse attitude/ or physician attitude/ or patient attitude/
(48932)
 - 10 attitude/ or attitude\$.tw. (73587)
 - 11 perception/ or (perception\$ or perceive\$).tw. (142016)
 - 12 barrier\$.tw. (97777)
 - 13 (accept\$ or rejection or willingness).tw. (278073)
 - 14 behavior/ or motivation/ (105523)
 - 15 (intention\$ or motivat\$).tw. (71526)
 - 16 decision making/ or (decision\$ adj1 making).tw. (78039)
 - 17 or/9-16 (782106)
 - 18 qualitative research/ or qualitative.tw. (73896)
 - 19 exp interview/ (60764)
 - 20 health survey/ (75971)
 - 21 exp questionnaire/ (164048)
 - 22 information processing/ (66875)
 - 23 (interview\$ or survey\$ or focus group\$ or questionnaires\$ or narrat\$ or
experience\$).tw. (850724)
 - 24 observational study/ or observation\$.tw. (489505)
 - 25 or/18-24 (1509918)
 - 26 8 and 17 and 25 (294)
 - 27 from 26 keep 1-294 (294)

Database: PsycINFO <1806 to July Week 3 2010>

Search Strategy:

-
- 1 immunization/ or vaccin\$.tw. (2506)
 - 2 (h1n1 or swine flu or h5n1 or avian flu or bird flu).tw. (99)
 - 3 1 or 2 (2583)
 - 4 epidemics/ or (pandemic\$ or epidemic\$ or outbreak\$).tw. (7129)
 - 5 Bioterrorism/ or (bioterror\$ or emergency or emergent).tw. (18614)
 - 6 4 or 5 (25567)
 - 7 3 and 6 (291)
 - 8 Health Personnel Attitudes/ or Health Attitudes/ or Attitudes/ or attitude\$.tw. (166439)
 - 9 Communication Barriers/ or barrier\$.tw. (25197)
 - 10 Risk Perception/ or Perception/ or (perception\$ or perceive\$).tw. (265390)
 - 11 (accept\$ or rejection or willingness).tw. (90606)
 - 12 Consumer Behavior/ or Client Attitudes/ (23532)
 - 13 Intention/ or Motivation/ or (intention\$ or motivat\$).tw. (123477)
 - 14 decision making/ or choice behavior/ (41198)
 - 15 (decision\$ adj1 making).tw. (44649)
 - 16 or/8-14 (610471)
 - 17 Qualitative Research/ or qualitative.tw. (56552)
 - 18 interviews/ (5241)
 - 19 Mail Surveys/ or Consumer Surveys/ or Telephone Surveys/ or Surveys/ (5346)
 - 20 questionnaires/ (11041)
 - 21 (interview\$ or survey\$ or focus group\$ or questionnaire\$ or narrat\$ or experience\$).tw.
(647996)
 - 22 observation methods/ or observation\$.tw. (90753)
 - 23 or/17-22 (731033)
 - 24 7 and 16 and 23 (34)
 - 25 from 24 keep 1-34 (34)

APPENDIX C. ABSTRACT SCREENING AND DATA ABSTRACTION FORM

STEP 1. SCREENING QUESTIONS

1. The study refers to:

H1N1 vaccine ☐ H5N1 vaccine ☐ Anthrax vaccine ☐

Smallpox vaccine ☐ Pandemic vaccine ☐

Preventative/response measures/behaviours ☐

Other ☐ Specify _____

2. The study outcome measures include:

- the views, opinions, concerns or beliefs of vaccines, or
- barriers or predictors of vaccine use (knowledge, perceptions, attitudes etc), or
- decision-making process of the emergently released vaccine use

YES ☐ NO ☐

The study must examine more than knowledge of the overall disease and/or knowledge of the vaccine to be eligible for the review.

3. The study method(s) is/are:

Focus group ☐ Interview ☐ Survey ☐

Questionnaire ☐ Other ☐ Specify _____

COMMENTS:

OBTAIN POTENTIALLY ELIGIBLE ARTICLES & PROCEED TO THE NEXT STEP. CONDUCT AN INDEPTH REVIEW TO DETERMINE FINAL INCLUSION STATUS.

STEP 2. INDEPTH REVIEW & DATA EXTRACTION

Study Identification and Characteristics

Title:

Authors:

Country of Study:

Study Funding:

Journal name:

Year of publication:

Volume:

Pages:

Study Characteristics

Population (check all that apply)

Healthcare workers

☐

Specify _____

General population:

Adults

☐

Students

☐

Parents

☐

Other

☐

Specify _____

Not specified

☐

Intervention

H1N1 vaccine

☐

H5N1 vaccine

☐

Anthrax vaccine

☐

Smallpox vaccine

☐

Pandemic vaccine

☐

Other

☐

Specify _____

Outcome measures: _____

Study design

Survey: Structured questionnaire

☐

Open-ended questionnaire

☐

Interview:

Structured

☐

Semi-structured

☐

Unstructured

☐

Focus group

☐

Other

☐

Specify _____

Language
English ☐ Other ☐ Specify _____

Authors' objective: _____

Comments:

Inclusion/Exclusion Criteria

	Yes	No
Study data collected using a survey	☐	☐
Study population is the general public	☐	☐
Intervention is H1N1, H5N1, pandemic vaccine	☐	☐
Study reports on personal intention to vaccinate	☐	☐
Study reports quantitative data on barriers and/or predictors of vaccination	☐	☐
Study is reported in English	☐	☐

PROCEED TO DATA EXTRACTION IF ANSWERS ARE ALL YES

DATA EXTRACTION FORM

Sample size:

Data collection

1. How were the participants identified?
2. What type of attempts were made to contact subjects?
3. How many attempts were made to contact subjects?
4. How many people were approached?
5. Who approached the potential subjects?
6. Where were the potential subjects approached?
7. How many people agreed to participate?
8. How was informed consent obtained?
9. How did those who agreed to participate differ from those who didn't ?
 - recruitment approach:
 - demographic differences:
10. How was the survey administered?
11. What was the response rate?

Incentive to participate

Compensation provided? Yes ☐ Amount _____ No ☐ N/A ☐

Reimbursement provided? Yes ☐ Specify _____ No ☐ N/A ☐

Willingness to receive vaccine: _____ %

Themes Identified in Study

Themes	<u>Comments & pg # where ref was found</u>
Risk of infection	
1.Novelty of disease	

2.Exposure/Proximity of public health issue	
3.Transmission	
4.Severity of morbidity	
5.Personal control	
6.Immunity	
Harm from vaccine	
7.Safety/ Novelty of vaccine	
8. Acceptance of previous vaccination	
9. Vaccine contraindication	
Necessity	
10.For employment	
11.Belief of vaccine ineffectiveness or not necessary	
12.Weighing risks versus benefits	
Distrust	
13.Distrust of motivation for vaccination program (government & pharmaceutical company)	
14.Lack of liability and concerns for compensation	
15.Conflicting opinions	
16.Credibility of information providers	
Communications/ Information resources	
17.Recommendations from health care professionals	
18.Media representation of disease/vaccine	
19.Public health messages	
20.Lack of knowledge of disease/vaccine	
21.Influence of family and friends	
Access	
22.Inconvenience: interfere with work, time	
23.Financial costs	
24.Availability: priority groups	
Societal role/responsibilities	
25. Setting an example, decrease risk to others; protect children and patients	
Others	
26.Alternative treatments: preference for natural treatments	
27.Anti-vaccination attitude	
28.	
29.	
30.	

APPENDIX D. FOCUS GROUP RECRUITMENT MATERIAL

1. Advertisement in Metro Newspaper-Ottawa and on <http://www.publichealthpolicy.org/>

RESEARCH STUDY SEEKING VOLUNTEERS	Do you have an opinion about the H1N1 vaccine? Were you concerned about the safety and efficacy of H1N1 and related vaccines? We are conducting a research study on attitudes towards H1N1 vaccination and are looking for participants to express their opinion.	REQUIREMENTS: Interested individuals over 18 years of age. Able to understand, communicate in English, and participate in a group interview to be held in Ottawa.	CONTACT: Kirsten Holdt Henningsen at 613-798-5555 ext. 15937 or kholdthenningsen@ohri.ca This study has been approved by The Ottawa Hospital Research Ethics Board Supported by the Canadian Institutes of Health Research
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2. Facebook event invitation





What's your opinion?!?!?

Public Event · By Trang Nguyen and Kirsten Holdt Henningsen

October 27, 2010 at 5:30pm until November 4, 2010 at 8:30pm

The Ottawa Hospital

Do you have an opinion about the H1N1 vaccine???
Were you concerned about the safety and efficacy of the H1N1 and related vaccines???

For my master's thesis project, I will be conducting focus groups (please pick from one of the following dates Oct 27, Nov 1, 2, 3 or 4 in the evening) to gain insight on attitudes towards H1N1 vaccination and am looking for participants to express their opinion.

Requirements:
Interested individuals over 18 years of age.
Able to understand, communicate in English, and participate in a group interview that will be held in Ottawa.

CONTACT:
SEND ME (Trang) or KIRSTEN a MESSAGE on FB!
613-798-5555 ext 15873 or 12787
kholdthenningsen@ohri.ca
trnguyen@ohri.ca

Please invite friends from your network who might be interested.

Looking forward to chatting with you!

Thanks!
Trang & Kirsten

This study is supported by the by the Canadian Institutes of Health Research and has been approved by the Ottawa Hospital Research Ethics Board.

APPENDIX E. SCREENING QUESTIONNAIRE FOR FOCUS GROUPS

- 1. Hi. My name is Trang.** I am the research assistant for this research study.
Thank you for your interest in our study to examine people's attitudes towards the H1N1 vaccine.

2. Where did you hear of our study?

- ☐ Advertisement in (FB, flyer, or Metro) _____
☐ Other (please note): _____

Now, to determine if you are eligible to participate in our study, I have the following questions for you.

3. Are you over 18 years old?

- ☐ yes ☐ no

If yes, continue on to the following questions.

4. During the last influenza season, 2009, were you aware that you were at high risk of complications to H1N1 influenza A and that you should get vaccinated?
(checking if potential participant was in a priority group)

- ☐ yes reason _____ ☐ no

5. Did you receive the vaccine?

- ☐ yes ☐ no

6. Are you a parent?

- ☐ yes ☐ no

If yes, continue on to the following questions.

7. How many children do you have? _____

8. During the last influenza season, 2009, were you aware that your children were at high risk of complications to H1N1 influenza A and that you should get vaccinated?

- ☐ yes reason _____ ☐ no

9. Did your child (ren) receive the vaccine?

- ☐ yes ☐ no

Thank you for answering the questions above. You are eligible for the study.

(If not eligible for the study...You are not eligible for the study. Thank you for your interest in our study, we appreciate the time you have taken to answer our questions.)

Now, I'd to tell you a bit about this project.

We are conducting an analysis of the public's attitudes towards the H1N1 vaccine and other vaccines that may be released in an emergency situation. The study is conducted under the supervision of Dr. Kumanan Wilson, who is a physician at the Ottawa Hospital, a professor at the University of Ottawa and this study is funded by the Canadian Institute of Health Research. We want to examine the major factors underlying the decision-making process to accept or reject the H1N1 vaccine and other potential vaccines that maybe released under emergency situations. We hope to gain a better understanding of this issue through focus groups with participants such as yourself.

Your participation will involve of your attendance in a group interview that will take place on a weekday evening at the Ottawa Hospital (or the University of Ottawa). The group interview will last two hours. Before the interview you will be asked to provide your consent to participate in our research study. During the group interview you will be asked to share your thoughts (positive or negative) on the H1N1 vaccine and any related concerns you may have. You will receive a compensation of \$70 for your time at the end of the group interview.

Given what I have shared with you about our study, are you still interested in participating in our study?

If yes,

1. What is your full name and what is your age (write down the sex)? (if not given previously)
2. We are currently still in the recruitment process. Our interviews will take place in the evening on October 27 which is a Wednesday and the first week of November from Monday to Thursday. Do you have a preference for a day? Yes (write down) What is the most convenient way we can get in contact with you to provide you with confirmation date and time for the interview? (email and/or phone number). We will send you a confirmation email several days before the interview with a map of the location.(or call if no email address)
3. Thank you very much for your interest. We are looking forward to seeing you at the interviews.

Please note if participant is female or male.

APPENDIX F. FOCUS GROUP GUIDE

THE USE OF A NEW VACCINE RELEASED DURING A PUBLIC HEALTH EMERGENCY: USING THE H1N1 VACCINE AS A CASE STUDY

A. Introduction [5 min]

Good evening and welcome. I would first like to thank everyone for taking the time to join our group discussion tonight. My name is Trang, I am the research assistant for this study and will be facilitating tonight's session. Assisting me tonight is....

Last fall/winter season there was a public health emergency vaccination program here in the city of Ottawa and all over Canada for the novel H1N1 influenza A virus. The goal of the discussion tonight is to get a better understanding of **how you came to your decision as to accept the new H1N1 vaccine or not**. When I say "accept the new H1N1 vaccine" what I mean is did you get vaccinated or not, or did you make the decision to get your children vaccinated or not with the new H1N1 vaccine.

The information that you will share today will be used to determine the barriers and facilitators of the acceptance of new vaccines in the case of future public health emergencies. These results can serve to better inform future public health campaigns in order to be more useful to you regarding your decision to vaccinate.

There is no right or wrong answers; we are trying to understand how different people approach this issue, so please answer frankly and speak up if you disagree. We expect that you will have different opinions and everyone's opinions are respected. We encourage you to have conversations with one another to share your views. I am here to ask questions, listen and make sure everyone has a chance to share. We're interested from hearing from each of you, and to make sure I am able to cover all of the questions I have within our time limit, I may interrupt you, or I may ask you to give others a chance, or I may ask you to share if you haven't. Some questions may seem repetitive, but we want to make sure we get the information that we need so please bear with me.

We're recording the session because we don't want to miss any of your comments. No names will be included in any reports and comments will all be kept confidential. *(If you haven't done so yet, please take a moment to read and sign the consent form in front of you)*

Before we start, does anyone have any questions right now about the study?

[5 min] Alright, let's begin. Let's find out more about each other by going around the table for self-introductions – please say your first names, and whether you got vaccinated last fall with the new H1N1 vaccine, and why you are here. My name is Trang, I got vaccinated and I am conducting these focus groups as a part of my Master's research project.

Thank you now that we are more familiar with each other, we'll begin our discussion.

B. Discussion

In recent years, a number of new vaccines have been made available to the public and concerns have emerged about the public's acceptance of new vaccines. To begin the discussion, I'd like to start with a more general question.

1. What are your general views on vaccination? [10 min]

Do most people seem to agree with that?

Now for the rest of the discussion, I have specific questions about last year's H1N1 pandemic and vaccine.

TDF domain-Knowledge

2. What are your thoughts on the vaccination program and how that was implemented in response to the H1N1 pandemic? [10 min]

(i.e. creation of priority groups for the H1N1 vaccine, access to the vaccine, etc)

Did anyone see/experience it differently?

2a. Did anyone get H1N1 or thought that they had H1N1?

Please take a moment to think the H1N1 vaccine and your personal experience with it.

3. Give us your thoughts on the H1N1 vaccine? What did you do? [10 min]

Probes: Was making the decision to vaccinate something you take the time to think about or does it come automatically? Was it a difficult decision? Were there any moral issues that you had?

TDF domain - Motivation/goals

Did you feel that you needed to get vaccinated? Why or why not?

TDF domain - Beliefs about capabilities:

How confident are you in your decision about H1N1 vaccine?

Now if you have children, were you comfortable with making a decision regarding the H1N1 vaccine for your children, why or why not?

Thank you....Are there others who wish to comment on the question?

Now to go into more depth about your experience,

4. What are these main factors that influenced your decision to accept or not accept the H1N1 vaccine and why? [20 min]

Probes: individual benefit, herd immunity, conspiracy, pharmaceutical industry

TDF domain -Memory, decision processes

What went through your mind when trying to decide whether to get the H1N1 vaccine or not?

Is there any specific piece information that guided your decision? Probes: stories, media

TDF domain -Beliefs about consequences:

What harms or benefits do you think were associated with the new vaccine?

Did benefits of the vaccine outweigh the risks?

TDF domain -Emotion

What emotions came into play when you were deciding to get the H1N1 vaccine or not?

TDF domain -Social role/identity:

Did you feel any social responsibility to get vaccinated or not with the vaccine?

TDF domain -Social influences:

To what extent did people around you (peers, colleagues, relatives, healthcare providers) influence your decision to get the vaccine?

Did you discuss the issue with people around you before making the decision whether to use the vaccine or not?

Are there other point of views?

4a. Were there any factors that influenced you in the execution of your decision?

TDF domain -Env'tal context/resources

What aspects of your physical environment influenced your decision? work, home etc

Are there any resource factors or time constraints that influence your decision? Ex. yes I don't have a car so clinic not accessible; I don't have a family doctor ; have to work, clinics at bad time, line up too long etc.

When it comes to getting more information about the H1N1 vaccine

5. Where or from whom did you get most of your information? [10 min]

Probes: public health, TV, radio, internet, social media, books, magazines, CAM providers, physician. Media reports of deaths and influence on decision. Trust in sources. What info would you like...

TDF domain -Skills:

Did you know how to obtain more information about vaccine?

Does anyone else use any other sources?

Thank you for sharing your thoughts on the H1N1 vaccine so far. Now let's move past H1N1. Let's say 6 years down the road, a new vaccine had to be released in response to an outbreak of a novel influenza virus, based on your experience

TDF domain -Behavioural regulation

6. KEY QUESTION How could your decision on vaccination with a new vaccine be made easier for you? [30 min]

Probes: How would you recommend public health officials engage the public?

What changes would you recommend?

Ok now to wrap it up and to tie everything we have discussed together...

TDF domain -Nature of the Behaviour

6a. If a similar public health emergency were to occur this winter what would you do?

C. Concluding: [5 min]

Thank you very much for coming to tonight. **Before you go does any one have any questions or comments?**

It was a pleasure to meet all of you. Your participation will contribute greatly to our research study and we appreciate you sharing your thoughts with us. If you have any further comments or feedback about tonight's discussion please feel free to contact myself or Kirsten. We would love to hear from you. Our contact information is here at the front.

Now before you go, if you have not yet provided us with your information for the honorarium please do so in order for us to send it to you. Once again, thank you for your participation tonight, have a good night and a safe drive home.

Probe: request for more information

What did you think of...?

How did you feel about the ...?

Where do you get new information?

What did you like or not like about the program?

Think back...

Please describe...

Tell me more about...

Would you explain further what you mean?

Can you give us an example?

Tell us more.

Is there anything else?

What experiences have you had that makes you feel that way?

Getting others involved

Thank you...Are there others who wish to comment on the question?

That's one point of view, let's hear about what others have to say?

BOB, I don't want to leave you out. What do you think?

BOB, you haven't had the chance to share. How do you feel about this?

Would someone like to answer that question?

Does anyone see/experience it differently?

Has anyone had a different experience?

Are there other point of views?

I noticed thatwasn't mentioned by any of you as a concern/factor ...is this relevant or important to any of you?

APPENDIX G. COMPARISON OF THEMES DERIVED FROM THE FOCUS GROUPS AND THOSE QUERIED IN THE SURVEYS INCLUDED IN THE SYSTEMATIC REVIEW

General beliefs within TDF domains		Studies in systematic review								
		Maurer 72	Rubin 69	Horney 67	Lau 64	Schwarzinger 74	Seale 70	Zijtregtop 30	Sypsa 75	Eastwood ⁶⁸ 73
Knowledge										
Vaccines			x	x						
Consequences from illness			x						x	
Scientific Literature					x		x			
General: H1N1 pandemic			x	x	x			x		
Knowledge from personally conducted research										
Conflicting information										
Other			x							
Skills										
Ability to do research										
Inability of find necessary info										
Other										
Social role/identity										
Identification with group				x		x		x	x	x
Beliefs about capabilities										
Perceived behavioural control					x		x	x		
Ease in decision making										
Control of material										
Beliefs about consequences										
Risk perception	Severity of public health issue	x	x		x	x	x		x	x
	Risk of infection		x	x	x	x	x	x	x	x

Vaccination attitude	Vaccine harms/safety	x	x	x	x	x	x	x	x	
	Consequence from illness		x		x	x	x	x	x	x
	Social responsibility		x		x		x			
	Acceptance of previous vaccination		x	x	x	x	x	x	x	x
	Vaccine necessity			x	x	x	x		x	
	Vaccine effectiveness		x	x	x	x	x	x		
	Past experiences				x				x	
	Anti-vaccination attitude					x	x			
	Vaccine believer					x				

Risk versus benefits analysis

Motivation and goals

Necessity

Lack of necessity

Lack of overall motivation

Other

Memory, attention, decision process

Decision making Automatic
Process

Attention

Environmental resources/context

Vaccine delivery Organization
Access
/availability

Work

Resources		x	x	x	x	x		x	
Environmental context							x		
Vaccine development									
Social influences									
Friends/Family		x	x	x	x			x	
Social network									
Media		x	x	x					
Healthcare professional		x	x	x		x	x	x	
Public health/government		x	x	x		x	x	x	
Research evidence									
Internet				x					
Alternative medicine providers									
Work		x	x	x					
Culture									
School									
Emotion									
Fear/worry/concern	For self		x	x		x		x	x
	For others		x	x		x		x	
	Context of pandemic						x		x
	Lack of								
Guilt									
Confusion							x		
Lack of emotional response									
Other									
Behavioural regulation									
Alternatives			x	x			x	x	

Intention	Environmental context/resources
Moderator	Social influences
	Emotion
Self monitoring	Knowledge
	Skills
	Social role/identity
	Beliefs about capabilities
	Beliefs about consequences
	Environmental context/resources
	Social influences

Nature of the behaviour											
H1N1 vaccination	x					x					
Intention to vaccinate		x	x	x		x	x	x	x	x	x
Other											
Different locations for vaccination			x							x	
Comparison of H1N1 with seasonal				x							
PH response is doing good job							x				
Over-reaction		x									
Government's preparedness/ trust in government		x									x
Confidence in vaccine decision											x
Had H1N1 or knew someone with illness		x				x	x	x		x	x
Mandatory vaccination								x			
Vaccinating children			x								x
Incentives								x			

"x"-data relating to general beliefs were queried in original study of the systematic review