

**Investigating Vaccine Hesitancy in Canada: A Quantitative and Qualitative
Description of Vaccine Attitudes, Beliefs, and Perceptions of the Seasonal Influenza
Vaccine.**

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Thesis Abstract

The overarching objective of this thesis was to investigate the phenomenon of vaccine hesitancy in Canada and examine relationships among vaccine beliefs, socio-demographic characteristics, and seasonal influenza immunization. Quantitative findings were derived from a national health risk perception survey administered to adults across Canada (N = 1,125). Respondents were asked to provide their level of agreement (1 = do not agree at all to 5 = agree completely) with 2 vaccine-related behaviour statements and 21 vaccine-related beliefs statements. A principal components analysis was performed to reduce the number of belief statements into meaningful components. Two components were retained and reflected negative beliefs about ‘vaccine safety’ and positive beliefs about ‘vaccine regulation and benefits’.

Descriptive results presented in the first study indicated a heightened uncertainty about the long-term side effects of vaccination, particularly with respect to the purported link between the Measles-Mumps-Rubella vaccine and the development of autism, among survey respondents. Multivariate analyses identified differences in the endorsement of numerous vaccine beliefs according to age and educational attainment. Findings revealed that older respondents and respondents without a university education demonstrated more negative attitudes towards vaccination, whereas younger respondents and respondents with a university education demonstrated more positive vaccine attitudes, respectively. Finally, both components of vaccine beliefs were significant predictors of vaccine-related behaviours, including discussing information about vaccines with others and reported receipt of the seasonal influenza vaccine.

The second study investigated interrelationships among components of vaccine beliefs, socio-demographic characteristics, and reported receipt of the seasonal influenza

vaccine. A mediation analysis revealed that higher levels of agreement with the statement ‘I usually get the seasonal flu vaccine’ among older adults was associated with lower levels of agreement with negative beliefs about vaccine safety in conjunction with higher levels of agreement with positive beliefs about the regulation and benefits of vaccines, whereas the opposite was true for younger adults. Also, a significant moderation analysis revealed that among respondents with greater concern about vaccine safety, those with higher educational attainment reported lower levels of agreement with the statement ‘I usually get the seasonal flu vaccine’ compared to those with lower educational attainment.

Recognizing the limitations of quantitative findings, a qualitative investigation was undertaken to provide more in-depth insight on the factors driving influenza immunization among healthy adults. A thematic analysis was performed on transcripts from 6 semi-structured focus group discussions with a total of 18 participants residing in Ottawa, Ontario. Findings identified 7 themes and 8 sub-themes related to contextual, vaccine specific, and individual determinants of vaccine hesitancy. Participants predominantly discussed themes related to individual determinants of vaccine hesitancy (perceived severity, susceptibility, and likelihood of contracting the influenza virus; personal interests; interactions with healthcare professionals). The perceived novelty, severity and effectiveness of the influenza vaccine, as well as a lack of information and discontent with communication by government health authorities and the media were also discussed. Overall, findings identified salient themes informing vaccine decision-making and behaviours among a sample of educated adults, which can inform subsequent studies investigating influenza immunization in a more representative sample of Canadian adults.

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Preface

Upon beginning my doctoral degree in Population Health in September 2011, I joined a team of researchers interested in factors associated with public risk perception. As part of the development of a national survey on public risk perception, I was given the opportunity to study a more specific topic that related to risk perception and population health. Coincidentally, a measles epidemic was unfolding in Quebec and suboptimal immunization coverage was suggested to have contributed to the outbreak; it was described as the largest measles outbreak in North America in the last decade. This incident made it apparent that public doubts about vaccination and perceived vaccine risks could have negative consequences on the health of populations.

The term ‘vaccine hesitancy’ had not yet been popularized, and the degree to which hesitancy affected population-levels of vaccine coverage remained unclear. Hence, this thesis project began as an exploratory investigation of public attitudes and beliefs on vaccines and immunization, and sought to contribute important findings to a growing body of literature on vaccine hesitancy. Since the collection and preliminary analyses of the data, literature on vaccine hesitancy has expanded considerably, with important conceptual insight recently provided by the Strategic Advisory Group of Experts (SAGE) Working Group on Vaccine Hesitancy. In the winter of 2015, media coverage of vaccine hesitancy was at an all-time high following a measles outbreak in the United States that resulted in a total of 159 reported cases of measles across 18 states and the District of Columbia (CDC, 2015). The latter is one of the most recent reminders of the persistence of vaccine resistance and the growing presence of anti-vaccination advocates.

This thesis project sought to explore the phenomenon of vaccine hesitancy in Canada using both quantitative and qualitative research methods. Ethical approval from the

University of Ottawa Research Ethics Board was obtained prior to the undertaking of both quantitative and qualitative investigations. The quantitative findings of this study were derived from a national survey on health risk perception administered to adults across Canada. A team of researchers, myself included, developed the survey questionnaire in a series of group meetings held throughout the 2011-2012 academic year. This is the third iteration of a national health risk perception survey led by principal investigators Drs. Krewski and Lemyre, with the overall purpose of investigating public perceptions of risk associated with a wide range of population health hazards. Sections of the survey used in the present thesis are presented in Appendix A.

Ekos Research Associates, a professional survey research firm based in Ottawa, Canada and member of the Marketing Research and Intelligence Association of Canada (MRIA), was responsible for population sampling and the administration of the survey via computer-assisted telephone interviews and a secure web server (online survey). Data management was undertaken by a team of researchers at the University of Ottawa's GAP-Santé research unit, and individual researchers, myself included, were responsible for analyzing the final dataset. The qualitative data presented in this project was collected and analyzed by myself, with guidance from Dr. Christine Dallaire, an expert in qualitative research methods.

This is an article-based thesis. The thesis consists of a general introduction to vaccine hesitancy, followed by three manuscripts, a general discussion of the findings, and a list of references for the first and final chapters.

Chapter 1: General Introduction

Context

Vaccination is a public health intervention aimed at reducing the prevalence and incidence of disease and improving the health of populations. The Public Health Agency of Canada (PHAC) notes that: ‘the objectives of immunization programs are to prevent, control, eliminate or eradicate vaccine-preventable diseases’ (PHAC, 2014a, p. 1). As the number one contributor to decreased morbidity and mortality around the world, vaccines are considered one the greatest public health achievements of the twentieth century (CDC, 1999). In addition to providing direct protection to vaccinated individuals, non-vaccinated individuals are indirectly protected when high rates of vaccination coverage are achieved, a concept known as herd immunity. Herd immunity provides community-level protection against vaccine-preventable diseases by reducing the transmission of disease in the population and decreasing the risk of infection, resulting in improved health for all community members (Fine, Emes, & Heymann, 2011). Maintaining high levels of vaccination coverage across populations is therefore crucial to the overall success of vaccination programs.

In most developed countries, rates of childhood immunizations remain high, indicating that these vaccines remain widely accepted in these areas of the world (WHO, 2014a). In Canada, vaccination services are available to the majority of the population and rates of childhood morbidity and mortality associated with vaccine-preventable diseases remain considerably low (WHO, 2014a). However, recent outbreaks of vaccine-preventable diseases in areas where they were once considered eliminated has brought considerable attention to growing public resistance towards vaccination. Notably, measles outbreaks have recently occurred in several European and North American countries, resulting in substantial

media exposure and increased attention to the impact of vaccine resistance on immunization coverage (De Serres et al., 2013; PHAC, 2014b; CDC, 2015). Outbreaks occurring in the United Kingdom eventually spread to Canada, and in 2011 Quebec experienced the largest measles outbreak in North America in a decade (De Serres et al., 2013). A growing presence of anti-vaccination advocates and concurrent outbreaks of vaccine-preventable diseases raised concerns among the scientific community and prompted research focusing primarily on the factors underlying parental compliance with childhood vaccination programs (Hobson-West, 2003, 2007; Gust et al., 2003; 2005ab; Casiday, 2007; Falagas & Zarkadoulia, 2008; Brown et al., 2011; Opel et al., 2011ab; Dubé et al., 2013; Gowda & Dempsey, 2013). Still, childhood immunization programs remain widely successful in many areas of the world, whereas similar levels of vaccine coverage are not apparent for adult immunizations. Importantly, addressing low coverage of adult immunizations has become increasingly relevant in the context of a rapidly aging population (Wheelock et al., 2014).

Adult Immunization: The Case of Influenza

Influenza is considered one of the most commonly occurring vaccine-preventable diseases in adults (NVAC, 2012). In developed countries, including Canada, an estimated 10-20% of the general population becomes infected with the influenza virus each year (WHO, 2008a; PHAC, 2015a). Rates of morbidity and mortality attributable to the influenza virus are difficult to ascertain and calculation methods have been widely debated (Wilson, 2011; Doshi, 2013). Acknowledging limitations in measuring the overall incidence of influenza, it is estimated that an average of 12,200 hospitalizations and 3,500 deaths attributable to influenza occur in any given year in Canada (Schanzer et al., 2006; 2007; 2008; 2013ab; PHAC, 2015a).

In contrast to childhood vaccination rates, which remain considerably high, adult immunization coverage, notably for seasonal influenza, remains suboptimal in many developed countries, including Canada (NVAC, 2012; PHAC, 2012; Statistics Canada, 2015). The influenza vaccine is recommended for all individuals aged 6 months and older without contraindications (PHAC, 2015a); however, annual influenza immunization is more strongly encouraged for individuals at higher risk of influenza-related complications or hospitalization including all children 6-59 months of age, pregnant women, aboriginal populations, individuals ≥ 65 years of age, residents of nursing homes and other chronic care facilities, and individuals with pre-existing chronic health conditions (PHAC, 2015a). Still, high rates of influenza immunization across all individuals in the population is encouraged in order to reduce the prevalence of disease and increase protection for vulnerable populations who cannot be immunized, are not yet fully immunized, or do not build strong immunity to vaccines (PHAC, 2012).

Despite extensive promotion of influenza vaccination programs by public health officials (Doshi, 2013), many individuals choose not to receive the seasonal influenza vaccine. In 2012, the adult National Immunization Coverage survey (aNIC) conducted by the Public Health Agency of Canada estimated that 37.2% of Canadian adults were immunized for seasonal influenza, and that coverage for the general adult population has been less than 40% since 2001 (PHAC, 2012). Importantly, there is currently no national vaccination registry in Canada, resulting in fragmented data, which prevents the accurate representation of vaccination coverage across all provincial jurisdictions and limits effective surveillance.

Suboptimal adult immunization rates for seasonal influenza are indicative of vaccine resistance that extends well beyond childhood vaccination programs (PHAC, 2012; Statistics

Canada, 2015). Recent investigations have therefore sought to provide important insight on vaccine decision-making that extends beyond parental compliance with childhood immunization programs (NVAC, 2012; Velan et al., 2012; Wheelock et al., 2014; WHO, 2014b; Peretti-Watel et al., 2014; 2015). Importantly, concerns raised by anti-vaccine advocacy groups, which typically target childhood vaccinations, may result in a broader sentiment of public doubt about vaccination. While vaccine acceptance is thought to vary based on vaccine-specific issues (e.g., perceived vaccine risks and benefits, vaccination schedule, cost; WHO, 2014b), overarching beliefs about a variety of vaccination issues remain of importance as a means of addressing vaccine resistance. Importantly, vaccine resistance warrants further attention and understanding in order to better address varying public concerns and effectively communicate information on vaccination to targeted audiences (Nowak et al., 2015).

Overview of Vaccine Controversies

Despite the presence of public doubts and criticism since the development of the first vaccine, vaccination programs have been widely successful in achieving high population-levels of immunization coverage (Wolfe & Sharpe, 2002; Poland & Jacobson, 2011, Tafuri et al., 2014). Still, public resistance towards vaccination has arisen under varying circumstances. Early controversies surrounding the smallpox vaccine were largely related to the implementation of mandatory vaccination policies, which resulted in public resistance on the grounds that individual rights and freedom were being violated (Spier, 2001; Tafuri et al., 2014). Intervention strategies such as mass vaccination programs are often required to balance the public health interests of societies while considering the rights of individuals (Ries, 2004). In addition, vaccination evokes concerns that differ from other public health

interventions because its objective is to lower the probability of future harm by targeting healthy individuals who may not be aware of the risks associated with vaccine-preventable diseases (Poland & Jacobson, 2001; PHAC, 2014a). In fact, as a result of vaccination programs successfully lowering the prevalence of, and in some cases eliminating, many infectious diseases, new generations of individuals living in developed countries are largely unaware of the consequences associated with vaccine-preventable diseases. As a result, public concern has shifted to vaccine risks, propagated by the growing presence of anti-vaccination movements, the availability of confounding information, and issues of communication between experts and the public.

In the 1970s and 1980s, controversy surrounding the pertussis vaccine emerged following the publication of a scientific article suggesting that a small group of children had suffered neurological complications after receiving the DPT (diphtheria, tetanus and pertussis) vaccine (Kulenkampff et al., 1974). As a result, a staggering decline in pertussis vaccination ensued, followed by a series of whooping cough epidemics (Gangarosa et al., 1998; Baker, 2003). Subsequent investigations found the risks of such events to be very low, and the controversy has since been described as an instance of unfounded and irrational fears that resulted in serious public health consequences (Casiday, 2005). Unfortunately, this was not the last of scientifically unfounded claims that would call into question the safety of vaccines. The now infamous publication of the article by Andrew Wakefield et al. (1998) in the late 1990s has had lasting effects on vaccine decision-making and public perception of vaccine risks (Tickner, Leman, & Woodcock, 2006; Poland & Spier, 2010). This article highlighted findings supporting a link between the Measles-Mumps-Rubella vaccine and the development of childhood autism. Evidence from numerous studies has since disproven these claims and the article was retracted from the *Lancet* journal (Wilson et al., 2003;

Editors of the Lancet, 2010; Jain et al., 2015). Still, public concern with vaccine safety became increasingly apparent, as extensive media coverage and widespread dissemination of anti-vaccination messaging via the Internet and social media fostered growing uncertainty among the public (Wolfe, Sharpe, & Lipsky, 2002; Kata, 2012). Increased public concern with the adverse effects of the MMR was associated with lower rates of immunization coverage and subsequent measles outbreaks in Europe and North America. As a result, numerous studies have been devoted to disproving the findings reported by Wakefield et al. (1998) and to understanding parental resistance to the MMR vaccine and other childhood vaccinations (Wilson et al., 2003; Petts & Niemeyer, 2004; Cassel et al., 2006; Casiday, 2007; Brown et al., 2011; Jain et al. 2015).

By the time the controversy surrounding the MMR vaccine and the development of childhood autism had transpired, the number of recommended childhood vaccinations had steadily increased. This increase in recommended childhood vaccinations led to concerns about the potential adverse effects of thimerosal, an ethylmercury-based preservative used in vaccines. Reports suggest that inconsistent regulations enacted by health authorities and incomplete science on the safety of ethylmercury in vaccines led to the removal of all thimerosal-containing vaccines, and poor communication between experts and the public on this matter increased confusion about the overall safety of vaccination programs (Mnookin, 2011). Notably, a statement by the American Academy of Pediatrics referred to the removal of thimerosal-containing vaccines as a way of making ‘safe vaccines even safer’, which only heightened public confusion about vaccine risks (Offit, 2007; Mnookin, 2011).

More recently, novel vaccines, including those for the human papilloma virus (HPV), the seasonal influenza virus, and the H1N1 influenza A virus have received heightened public criticism. The novelty and, in some cases, mandatory nature of these vaccinations

resulted in increased public criticism and resistance (Haber, Mallow, & Zimet, 2007; Gostin & DeAngelis, 2007; Colgrove, Abiola, & Mello, 2010). Heated debates quickly followed the implementation of mandatory HPV vaccination programs for schoolgirls in many North American regions. Governmental coercion and infringement of civil liberties were issues of particular importance with respect to HPV vaccination programs, in addition to many other factors such as the novelty of the vaccine, concerns with vaccine safety, and the nature of the route of transmission of the virus (Colgrove, Abiola, & Mello, 2010). Controversy surrounding the HPV vaccination fuelled debate over mandatory vaccination legislations, highlighting issues of public confidence in government authorities and concern with the involvement of pharmaceutical lobbyists.

Heightened public questioning of the necessity and effectiveness of vaccines, particularly for novel vaccines, such as the seasonal influenza vaccine, persists despite strong endorsement by public health authorities (Ward & Draper, 2008). Public health officials are relentless in their efforts to communicate the importance of the seasonal influenza inoculation and increase population levels of immunization coverage. The vaccine is recommended for adults, children, and seniors on an annual basis, but strongly encouraged for populations considered at higher risk of developing serious complications from the illness (Health Canada, 2015). Due to frequent mutations of the influenza virus, a new vaccine is developed annually to immunize against novel strains, and the effectiveness of the vaccine has often been less than optimal. In fact, numerous reports have concluded that the effectiveness of the vaccine in preventing influenza and influenza-like symptoms is modest and the burden of disease unclear and often overestimated (Osterholm et al. 2011; Wilson, 2011; Doshi, 2013; Demicheli et al., 2014). It is therefore not surprising that factors influencing public refusal of the seasonal influenza vaccine include low perceived risk and

dread associated with contracting the influenza virus, doubts about the effectiveness of the vaccine, and concerns with experiencing influenza-like symptoms (Chapman & Coups, 1999; Ward & Draper, 2008; Hollmeyer et al., 2009; Osterholm et al., 2012).

In 2009, the spread of a novel and more severe strain of influenza, the H1N1 seasonal influenza A virus, was declared a pandemic and an imminent public health emergency (Chan, 2009). However, by the peak of the pandemic in December 2009, the effect was considered to have been moderate. Despite initial concern surrounding insufficient availability of vaccines, vaccine uptake was much lower than expected (CDC, 2010). A report by Statistics Canada revealed that 74% of Canadians did not think the vaccine was necessary, 67% of Canadians were not worried about contracting the H1N1 virus, and 78% of Canadians believed that the media had exaggerated the threat (Gilmour & Hoffman, 2010). While these criticisms were not unfounded (Wilson, 2011), they are likely a result of a long history of confounding information resulting in heightened public uncertainty about the safety, effectiveness, and necessity of novel vaccines. Findings from a longitudinal study conducted in the United States indicated that intentions to receive the H1N1 influenza A vaccine were predominantly associated with the perceived risk of contracting the H1N1 influenza A virus and previous receipt of the seasonal influenza vaccine (Gidengil et al., 2012). Findings also revealed that intentions to receive the vaccine declined as the pandemic progressed, highlighting the relevance of the novelty of risks in health-related decision-making (Slovic, 1987; SteelFisher et al., 2010; Gidengil et al., 2012). Interestingly, one report suggests that vaccine resistance among the public has increased since the implementation of the H1N1 influenza A vaccine program (Yaquub et al., 2014).

Risk Perception and Vaccination

Concepts of perceived risk play an essential role in understanding individual perceptions of medical technologies such as vaccination (Bostrom, 1997; Casiday, 2007; Weinstein et al., 2007; Brewer et al., 2007; Leppin & Aro, 2009; Larson, Paterson, & Erondy, 2012; MacDonald, Smith, & Appleton, 2012; Dupras & Williams-Jones, 2012). As highlighted by the aforementioned vaccine controversies, the public's perception of vaccine risks and subsequent concern with vaccine safety is a fundamental aspect of vaccine resistance and a driving force of anti-vaccination movements (Chen, 1999; Gust et al., 2003; Freed et al., 2010; Kata, 2012; NVAC; 2012). In addition, issues of complacency have arisen in light of low perceived risks attributed to vaccine-preventable diseases that have become uncommon in many developed countries (WHO, 2014b, MacDonald, 2015). A better understanding of the relationship between public adherence to vaccination programs and individual perceptions of health risks is therefore essential for the development of effective communication strategies promoting vaccine uptake.

Interest in public risk perception first emerged in response to public debates over use of technologies, which stemmed from risk-benefit trade-offs that were incongruent with expert predictions and explanations (Beck, 1992). In contrast to expert *risk assessment*, described as empirical and evidence-based, public *risk perception* is thought to rely on a judgment of the probability that no harm will occur if no preventive action is taken (Sjöberg, 1999; Slovic, 1999; Connor & Norman, 2005). Specifically, experts assess risk based on the quantifiable probability of an outcome, and 'uncertainty' is viewed as unquantifiable (Gigerenzer, 2002). In contrast, public perception of risk relies primarily on personal experience of harm and uncertainty to determine the probability of an outcome (Gifford, 1986). Differences between expert and public risk perception have been reported in the

literature, indicating higher perceived risk among the public compared to experts (Sjöberg, 1999; Slovic, 1999; Hansen et al., 2003; Krewski et al., 2012). These findings have primarily resulted from studies using the psychometric approach, which seeks to explain why public perceptions of risk are often at odds with expert calculations of risk probabilities (Fischhoff et al., 1978; Slovic, 1987). This framework ‘assumes risk is subjectively defined by individuals who may be influenced by a wide array of psychological, social, institutional and cultural factors that can be quantified’ (Slovic, 2000, p. xxii). The psychometric paradigm obtains information on perceived risk according to ratings of a list of potential hazards based on several dimensions (e.g., whether the hazard is known to science, controllable, novel, has effects that are immediate, catastrophic, controllable, severe; Fischhoff et al., 1978). In turn, the level of perceived risk, either high or low, ascribed to a list of potential hazards results in quantitative representations or ‘cognitive maps’ of the risk associated with these hazards (Slovic, 1987). Health risk perception surveys conducted in Canada have provided valuable insight on levels of perceived risk associated with a variety of potential hazards utilizing the psychometric paradigm (Krewski et al., 1995a; 1995b; 2006; 2008; 2009; 2012; Lemyre et al., 2006; Lee et al., 2005; 2008). Notably, findings have demonstrated that although the overall level of perceived risk that Canadians attribute to vaccines is low, respondents from the general public reported higher perceived health risks associated with vaccines compared to expert respondents (i.e., physicians and toxicologists) (Krewski et al., 2012).

Importantly, characteristics used to distinguish experts from the general public have been questioned, and underlying socio-demographic characteristics such as education are believed to be more indicative of differences in perceived risk (Rowe & Wright, 2001). In fact, personal and societal factors including socio-demographic characteristics, worldviews,

attitudes, and beliefs are considered important in understanding public risk perception (Slovic, 1999; Sjöberg, 2000; Bouyer et al., 2001; Lee et al., 2005; Krewski et al., 2008; 2012). Levels of perceived risk among members of the Canadian general public have been shown to vary based on individual characteristics including age, gender, and education (Krewski et al., 2006). In light of this, studies have sought to investigate individual differences in perceived risk rather than distinctions between types of hazards. For example, recent risk perception surveys have included ‘health belief statements’ to provide additional insight on differences in public risk perception across individuals in the population (Bouyer et al., 2001; Lee et al., 2005; Krewski et al., 2008; 2012). Health belief statements included in previous health risk perception surveys conducted in Canada were formulated in terms of knowledge, attitudes, risk acceptability, uncertainty, social norms, internal and external control, and perceived risk (Krewski et al., 1995a, 1995b, 2006, 2008, 2009; Lee et al., 2005; 2008; Lemyre et al., 2006).

Cognitive Dimensions of Risk Perception

Risk perception is a central component of many theories of health behaviour including, but not limited to, the health belief model (HBM; Rosenstock, 1974), protection motivation theory (PMT; Rogers, 1975, 1983), theory of planned behaviour (TPB; Ajzen, 1991), and the extended parallel process model (EPPM; Witte, 1992, 1994). These models expand on individuals’ appraisal of risk, which is two-fold: a primary appraisal determines whether the stimulus or potential hazard is a threat, and the secondary appraisal determines whether an individual has the ability and/or resources to manage or control the risk (Folkman & Lazarus, 1980). Models depict the interaction between cognitive processes of appraisal and the emotional input of fear (e.g., EPPM), although some emphasize the former rather than the latter (e.g., PMT). Overall, they seek to explain individual engagement in

protective behaviours based on concepts of uncertainty (about the risk), control (over risk exposure), severity (of the consequences), and social norms.

The health belief model has been applied in several studies investigating vaccination behaviour (Janz & Becker, 1984; Nexø, Kragstrup, & Sogaard, 1999; Brewer et al., 2007). In fact, a meta-analysis identified a strong association between the dimensions of risk perception outlined in the health belief model and vaccination behaviour (Brewer et al., 2007). Specifically, results from the meta-analysis revealed that higher perceived likelihood of contracting a vaccine-preventable disease, higher perceived susceptibility towards the disease, and higher perceived severity of the disease resulted in greater likelihood to be vaccinated, with particular significance for the seasonal influenza vaccine (Brewer et al., 2007). Many studies investigating vaccine uptake, in particular for the H1N1 influenza A vaccine, have measured levels of perceived likelihood, susceptibility, and severity to assess differences in acceptance and receipt of vaccines (Gidengil, Parker, & Zikmund-Fisher, 2012; Weinstein et al., 2007; Brewer et al., 2007; Chen, 2015). A recent study by Chen (2015) found that individuals with greater positive affect (i.e., ‘a feeling that something is good’; Slovic, et al. 2004, p. 311) towards the influenza inoculation demonstrated higher levels of perceived susceptibility to a hypothetical influenza virus and perceived the virus as more severe, resulting in increased vaccination intention. This finding suggests that individual affect (e.g. positive or negative feeling) and systematic thinking (e.g., perceived susceptibility and severity) work together to shape vaccine decision-making (Chen, 2015).

A more recent theoretical approach to risk perception highlights the cognitive dimensions underlying risk perception, suggesting that the relative nature of perceived risk results from cognitive acts that establish a relationship between a risk object (e.g., hazard) and an object at risk (e.g., something with value), in which the value of the object at risk is

considered threatened by the risk object (Boholm & Corvellec, 2014). Specifically, the relational theory of risk suggests that perceived risk results from cognitive activities trying to make sense of the uncertainty characterizing certain events and the outcomes of those events (Boholm & Corvellec, 2014).

The cognitive mechanisms of individual decision-making and behaviour have been at the center of the field of risk perception since its inception. Pivotal work by Tversky & Kahneman (1974) identified cognitive shortcuts used to facilitate complex decisions when faced with uncertainty and/or incomplete information, also known as ‘cognitive heuristics’. Cognitive heuristics are thought to facilitate complex decision-making by aligning new information with preconceived beliefs that can either be deeply rooted (e.g., religious beliefs) or reflect adherence to social norms (Smith, Appleton, & MacDonald, 2013). Previous findings have in fact demonstrated that presenting evidence-based information in support of vaccination to individuals with initial anti-vaccine convictions may actually reinforce concerns about vaccination, rather than promote vaccine acceptance as intended (Wilson et al., 2005). As such, while efficient under many circumstances, heuristics can also lead to systematic cognitive biases, most of which have been associated with vaccine decision-making. These include the availability bias (the use of information that is easily recalled or available), the compression bias (overestimating rare occurrences and underestimating frequent ones), the omissions bias (where action [vaccinating] is considered more harmful than inaction [not vaccinating]); anchoring (judging the probability of a future event based on past occurrence), free loading (relying on the acts of others to provide self-protection; i.e., herd immunity), and the optimistic bias (overconfidence in one’s own judgements and perceiving others to be more at-risk) (Tversky & Kahneman, 1974; Ritov & Baron, 1990; Ball, Evans, & Bostrom, 1998; Weinstein, 1987; Weinstein & Lyon, 1999;

MacDonald, Smith, & Appleton, 2012; Smith, Appleton, & MacDonald, 2013; Boerner et al., 2013; Taha, Matheson, & Anisman, 2014).

Throughout history, vaccine controversies have primarily arisen from claims of adverse events following vaccination. Health authorities remain concerned that heightened public doubt about the safety, effectiveness, and necessity of vaccines will hinder the success of current and future vaccination programs. As a result, efforts have been made to effectively disseminate evidence-based knowledge in favour of vaccination and increase awareness about the consequences of vaccine-preventable diseases (Immunize Canada, 2013). However, as previously mentioned, many individuals remain reluctant and preconceived beliefs remain unchanged, and in some cases are reinforced, in the presence of conflicting information on the benefits and risks of vaccines (Wilson et al., 2005; Smith, Appleton, & MacDonald, 2013). A better understanding of factors driving vaccine decision-making including elements of risk perception, and the subsequent development of effective communication strategies is therefore crucial to addressing public resistance towards vaccination (Larson, Paterson, & Erondy, 2012; Smith, Appleton, & MacDonald, 2013).

Vaccine Hesitancy

The heterogeneity of vaccine resistance suggests that varying degrees of vaccine reluctance and refusal are displayed both within and across populations. While only a small proportion of individuals are estimated to have strong anti-vaccine convictions resulting in complete vaccine refusal, a growing number of people are recognized as being hesitant towards vaccination (Leask, 2011; Leask et al., 2012; Larson, 2013). Leask et al. (2012) report that while less than 2% of parents are believed to refuse all vaccines for their child, between 20% and 30% of parents are believed to be hesitant towards vaccination, suggesting

that they have significant concerns about getting their child vaccinated (Leask et al., 2012). As a result, recent investigations have focused on identifying factors associated with vaccine decision-making among individuals that are either reluctant or undecided, might delay vaccination, or accept only certain vaccines while refusing others (Gust et al., 2005; Leask, 2011; Larson, 2013; Dubé et al., 2013).

The term ‘vaccine hesitancy’ emerged to better depict the heterogeneous nature of vaccine resistance, placing hesitant individuals on a continuum ranging from complete acceptance to complete refusal of vaccines (see Figure 1; WHO, 2014b; Macdonald, 2015). This continuum reflects earlier findings that identified several types of responses to vaccination programs, including resistance, passive acceptance, and active demand (Nichter, 1995; Streefland, Chowdhury, & Ramos-Jimenez, 1999). Hesitancy is described as a state of indecision that is difficult to measure but important to acknowledge in order to effectively engage individuals in the decision-making process and address specific concerns about vaccination, which if left unaddressed may lead to vaccine refusal (Leask, 2011; Larson, 2013).

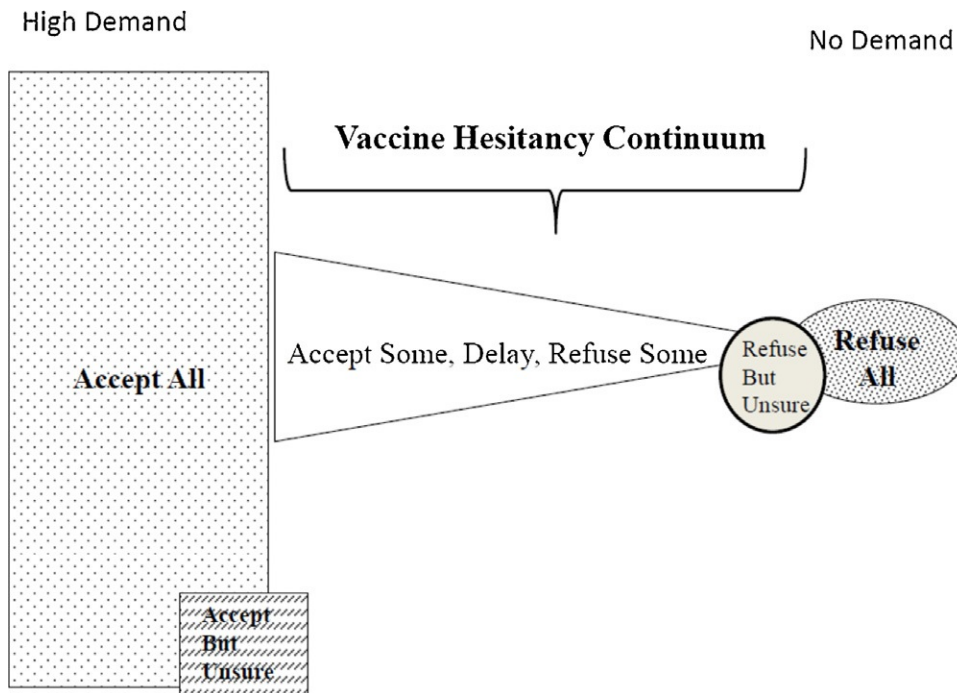


Figure 1. The continuum of vaccine hesitancy between full acceptance and outright refusal of all vaccines (MacDonald, 2015).

Most studies investigating vaccine hesitancy have focused primarily on factors influencing parental decision-making and compliance with childhood vaccination programs (Streefland, Chowdhury, & Ramos-Jimenez, 1999; Gellin, Maibach, & Marcuse, 2000; Gust et al. 2003; 2005a; 2005b; Mills et al., 2005; Sturm, Mays, & Zimet, 2005; Benin et al., 2006; Falagas & Zarkadoulia, 2008; Freed et al., 2010; Ekos Research Associates Inc., 2011; Opel et al; 2011a; 2011b; LaVail & Kennedy, 2012; Leask et al., 2012). These studies have provided important insight on salient factors associated with vaccine hesitancy among parents. For example, Opel et al. (2011a; 2011b) designed a survey to measure levels of parental vaccine hesitancy based on four factors that were empirically derived and subsequently validated. These factors pertained to vaccination behaviour, beliefs about vaccine safety and efficacy, attitudes about vaccine mandates, and trust (Opel et al., 2011a; 2011b). A pivotal study by Benin et al. (2006) investigating the knowledge, attitudes, and decision-making of mothers regarding childhood vaccinations identified important factors related to relationships between mothers and paediatricians that either promoted or inhibited vaccine acceptance. Finally, Leask et al. (2012) recently proposed communication strategies for healthcare professionals that are tailored according to five distinct parental positions on vaccination. These include unquestioning acceptors, cautious acceptors, the hesitant, late or selective vaccinators, and refusers (Leask et al., 2012). As demonstrated by the aforementioned initiatives, recognizing distinct patterns of vaccine hesitancy across individuals is important in order to better understand driving forces of vaccine decision-making and develop effective communication strategies that are tailored to specific concerns about vaccines and immunization.

A growing body of literature has sought to provide a population-based explanation of vaccine hesitancy that extends beyond parental compliance with childhood vaccinations

(Ritvo et al., 2003; Omer et al., 2009; Larson et al., 2011; Velan et al., 2012; Dubé et al., 2013; Larson et al., 2014; Yaqub et al., 2014; Perreti-Watel et al., 2015; (Dubé, Vivion, & MacDonald, 2015). Literature on vaccine hesitancy has emphasized the role of perceived vaccine risks and public confidence in government, science, and medical authorities in shaping vaccine decision-making and behaviour (Casiday, 2005; 2007; Cooper, Larson, & Katz, 2008; Larson et al., 2011; 2015). Importantly, while perceived vaccine risks and confidence/trust have been described as salient factors of vaccine hesitancy in industrialized countries, the relative strength of these factors on vaccine decision-making and behaviour is believed to vary across heterogeneous groups of individuals.

Several quantitative studies have sought to identify patterns of vaccine hesitancy across subgroups of the population based on individual attitudes and beliefs about vaccines and immunization (Ritvo et al., 2003; Leask et al., 2012; Velan et al., 2012; Yaqub et al., 2014). A recent study by Velan et al. (2012) identified various profiles of vaccine hesitancy across subpopulations based on attitudes associated with varying degrees of vaccine acceptance (e.g., general agreement with vaccine uptake), differentiation (e.g., decisions are based on specific vaccination programs), and individualism (e.g., personal control over vaccination). In addition to this, conceptual frameworks have been developed to further illustrate how the interrelationships among various factors associated with vaccine hesitancy can impact vaccine decision-making and subsequent behaviour (see Figures 2 and 3). These frameworks stem from reviews of the literature and highlight a multi-factor approach to understanding the underlying mechanisms of vaccine hesitancy.



Figure 2. Framework for understanding the different types of factors influencing parental vaccine hesitancy (Gowda & Dempsey, 2013).

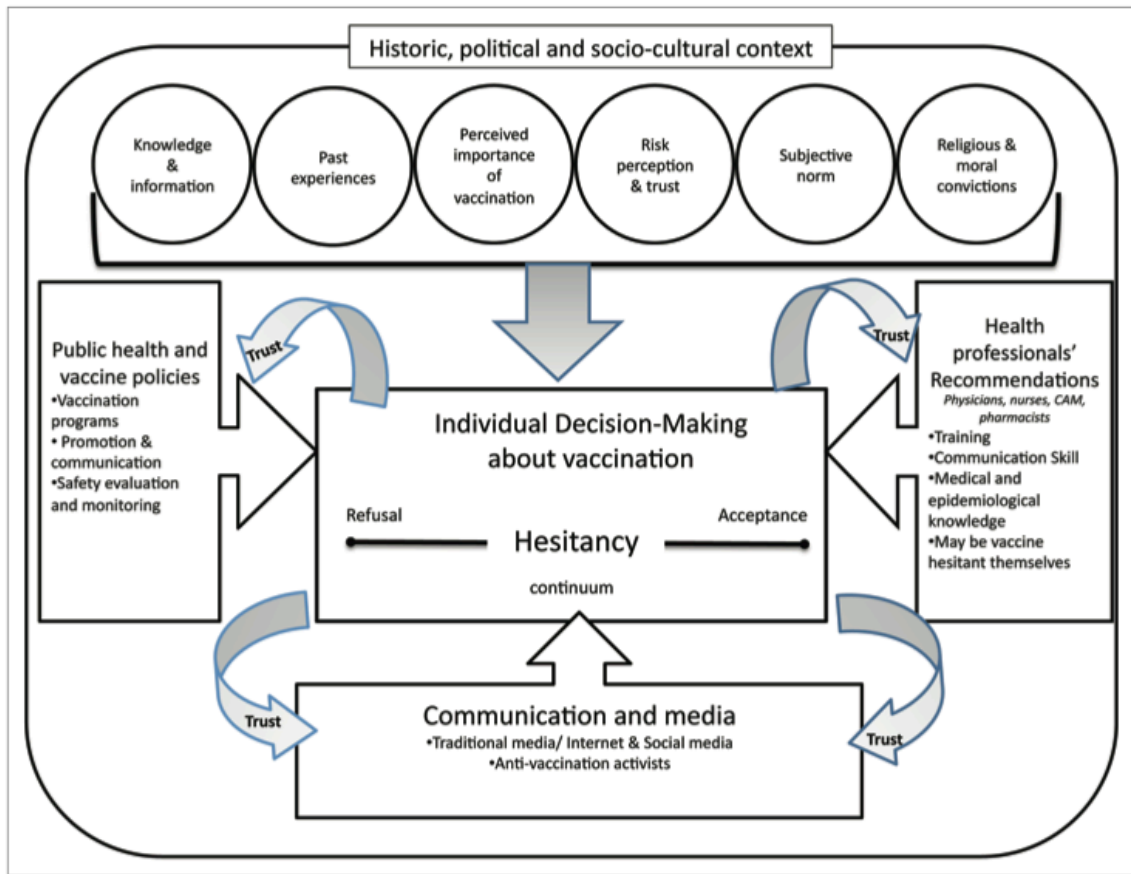


Figure 3. Conceptual model of vaccine hesitancy (Dubé et al., 2013).

Despite growing literature on the phenomenon of vaccine hesitancy, there remain notable discrepancies with respect to its definition. Recent reviews have defined vaccine hesitancy primarily as a behavioural outcome that results from a complex decision-making process influenced by a numerous factors (Dubé et al., 2013; WHO, 2014b). However, the latter depiction implies that vaccine hesitancy is a behavioural phenomenon, rather than a decision-making process that subsequently influences behavioural outcomes (i.e., vaccine receipt). In this respect, the concept of vaccine hesitancy is not distinguished from vaccine receipt, which is problematic because vaccine hesitant individuals may still choose to receive some or all recommended vaccines despite having serious concerns about doing so (Dubé et al., 2013). The latter therefore suggests that vaccine receipt does not necessarily equate to vaccine acceptance (or lack of vaccine hesitancy).

Peretti-Watel et al. (2015) recently acknowledged the ambiguous depiction of vaccine hesitancy in the literature, characterizing its current state as a ‘catchall category’ without a clear theoretical background. In response to this, they proposed a framework that depicts vaccine hesitancy as a decision-making process based on individuals’ active commitment to health- and vaccine-related issues and their level of confidence in health authorities (see Figure 4; Peretti-Watel et al., 2015). In this respect, individuals displaying active involvement in their health, also known as ‘healthism’ (Greenhalgh & Wessely; 2004), and heightened distrust in health authorities are thought to demonstrate a more rationalized form of vaccine hesitancy, or enlightened conformism (Peretti-Watel et al., 2015). In contrast, individuals who are more indifferent towards health- and vaccine-related issues and also display higher levels of confidence in health authorities are thought to exhibit a more passive form of vaccine hesitancy, or passive compliance with vaccination programs (Peretti-Watel et al., 2015). The present thesis supports Peretti-Watel et al.’s (2015)

depiction of vaccine hesitancy as a decision-making process resulting in varying behavioural outcomes, particularly with respect to vaccine receipt and population levels of immunization coverage, rather than reflecting a behavioural outcome in and of itself.



Figure 4. Two-dimensional map of vaccine hesitancy (Peretti-Watel et al., 2015).

The SAGE Working Group on Vaccine Hesitancy

In 1999, the World Health Organization (WHO) established the Strategic Advisory Group of Experts (SAGE) on Immunization to provide guidance on aspects related to vaccination (Schuster et al., 2015). Decreasing public acceptance of vaccines was a recurring issue brought forth by members of the group and growing concerns about the effects of vaccine resistance on rates of immunization coverage were summarized in a 2011 report (SAGE, 2011). This report prompted the creation of the SAGE Working Group on Vaccine Hesitancy in March 2012 (see Schuster et al., 2015 for further details). This working group was tasked with providing valuable insight on the phenomenon of vaccine hesitancy, including defining vaccine hesitancy and its scope (WHO, 2014b; Schuster et al., 2015). The SAGE Working Group on Vaccine Hesitancy provided a revised report outlining the conclusions drawn from expert meetings and reviews of the literature in November 2014 (WHO, 2014b). Notably, a literature review conducted by the working group indicated that there was no agreed-upon definition of this phenomenon. As a result, the Working Group developed the following definition:

‘Vaccine hesitancy refers to delay in acceptance or refusal of vaccination despite availability of vaccination services. Vaccine hesitancy is complex and context specific, varying across time, place and vaccines. It is influenced by factors such as complacency, convenience and confidence’ (WHO, 2014b; MacDonald, 2015).

The working group also recognized that vaccine decision-making is a complex process that is influenced directly and indirectly by numerous factors, for which the relative strength of influence may vary based on experience and circumstances within different settings (Larson, 2013; WHO, 2014b). The SAGE Working Group on Vaccine Hesitancy reviewed proposed models of vaccine hesitancy based on their complexity and global

applicability and concluded that of the numerous factors associated with this phenomenon, issues associated with confidence (trust in vaccine and/or provider), complacency (perceived value and necessity of vaccine), and convenience (access to vaccination) were considered the most salient factors associated with vaccine hesitancy (WHO, 2014b, MacDonald, 2015). As a result, the 3 Cs model was retained by the working group as a depiction of the most prominent factors associated with vaccine hesitancy (see Figure 5). A brief description of each factor is provided below.

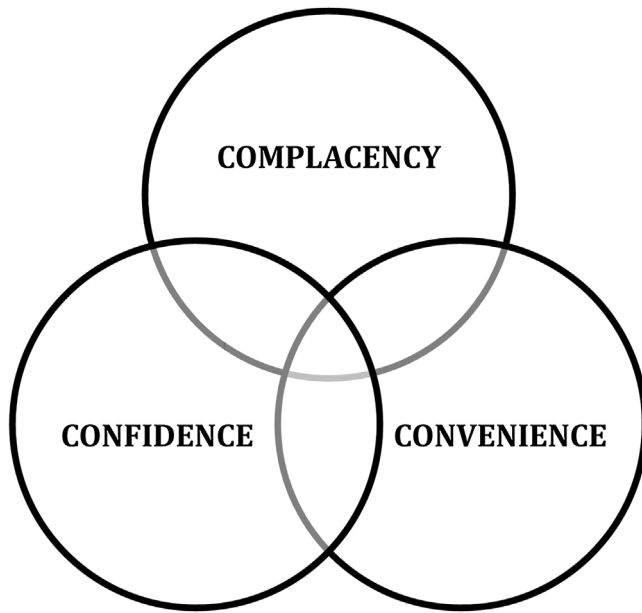


Figure 5. The 3 Cs model of vaccine hesitancy (WHO, 2014b; MacDonald, 2015).

Public trust in vaccines is often attributed to aspects associated with perceived vaccine safety, effectiveness, and necessity; however, *confidence* in vaccination extends beyond trust in vaccines themselves, and instead reflects an overall confidence in features of contemporary societies, such as the role of government authorities and motives of pharmaceutical companies (Larson et al., 2011). The public's interaction with and confidence in the medical community has been shown to play a predominate role in vaccine decision-making (Benin et al., 2006; Yaqub et al., 2014). In fact, the extent to which relationships with healthcare professionals (e.g., family physicians) are described as trusting and supportive was found to be a key factor in vaccine acceptance among the public (Benin et al., 2006, Yaqub et al. 2014).

Complacency is thought to be present when the perceived risk of vaccine-preventable diseases is low, impacting the perceived value of vaccines and the perceived necessity of vaccination (MacDonald, 2015). The success of immunization programs in reducing the prevalence of vaccine-preventable diseases has paradoxically resulted in a lack of public awareness of the detrimental consequences that can result from many of these diseases. Consequently, vaccine decision-making is often based on a risk-benefit trade off between vaccines and vaccine-preventable diseases, in which the risks of the latter are largely unfamiliar (MacDonald, 2015).

The *convenience* of vaccination is associated with several factors including the availability of vaccines and accessibility of vaccination clinics. For example, a study by Boerner et al. (2013) found that individuals who did not receive the H1N1 influenza A vaccine mentioned inconvenient line-ups and waiting time, whereas aspects that fostered convenient access to the vaccine (e.g., offered by a family physician, short line-ups) were mentioned by individuals that received it. In addition to geographical availability and

accessibility of vaccination services, affordability and willingness-to-pay are aspects of convenience that can subsequently influence vaccine decision-making and receipt (MacDonald, 2015). In Canada, healthcare services including publicly funded vaccination programs vary across provincial jurisdictions (PHAC, 2015b). Notably, some Canadian provinces lack a universal publicly funded immunization program for the seasonal influenza vaccine (PHAC, 2015b).

In addition to these factors, the SAGE Working Group on Vaccine Hesitancy developed a matrix of determinants of vaccine hesitancy based on extensive literature review (see Table 1; WHO, 2014b). Determinants included in the matrix are categorized as contextual influences (e.g., sociocultural, environmental), individual and group influences (e.g., personal and community perceptions, knowledge, attitudes and beliefs, social norms), and vaccine-specific issues (e.g., vaccine novelty, vaccination program/campaign, cost of vaccines) to reflect how the independent and relative strength of each factor (i.e., confidence, complacency, and convenience) varies across subgroups of the population based on the relevance of these determinants (WHO, 2014b). In light of the complexity of this phenomenon, the working group has called for more studies investigating the interrelationships of multilevel factors that contribute to vaccine hesitancy within and across populations (WHO, 2014b; Larson et al., 2014).

Table 1. Working Group on Vaccine Hesitancy Determinants Matrix (WHO, 2014b; MacDonald, 2015).

<p>CONTEXTUAL INFLUENCES Influences arising due to historic, socio-cultural, environmental, health system/institutional, economic or political factors</p>	<ul style="list-style-type: none"> a. Communication and media environment b. Influential leaders, immunization programme gatekeepers and anti- or pro-vaccination lobbies c. Historical influences d. Religion/culture/gender/socio-economic e. Political/policies f. Geographic barriers g. Perception of the pharmaceutical industry
<p>INDIVIDUAL AND GROUP INFLUENCES Influences arising from personal perception of the vaccine or influences of the social/peer environment</p>	<ul style="list-style-type: none"> a. Personal, family and/or community members' experience with vaccination, including pain b. Beliefs, attitudes about health and prevention c. Knowledge/awareness d. Health system and providers – trust and personal experience e. Risk/benefit (perceived, heuristic) f. Immunization as a social norm vs. not needed/harmful
<p>VACCINE/VACCINATION – SPECIFIC ISSUES Directly related to vaccine or vaccination</p>	<ul style="list-style-type: none"> a. Risk/benefit (epidemiological and scientific evidence) b. Introduction of a new vaccine or new formulation or a new recommendation for an existing vaccine c. Mode of administration d. Design of vaccination programme/Mode of delivery (e.g., routine programme or mass vaccination campaign) e. Reliability and/or source of supply of vaccine and/or vaccination equipment f. Vaccination schedule g. Costs h. The strength of the recommendation and/or knowledge base and/or attitude of healthcare professionals

Vaccine Hesitancy and Population Health

Rates of immunization against vaccine-preventable diseases have undeniable effects on individual and community health and wellbeing. Importantly, heightened vaccine hesitancy can impact vaccination coverage, resulting in negative outcomes for the health of populations. As such, vaccine hesitancy is considered a ‘population health issue’.

Population health focuses on a broad range of health determinants to guide policies and interventions that will promote positive health outcomes within and across populations (Kindig, 2007). This approach recognizes that many individual and environmental factors, which may not appear to be directly related to health, are important indicators of health outcomes (Etches et al., 2006). In this respect, the health of a population is said to be influenced by social, economic, and physical environments; personal health practices; individual capacity and coping skills; human biology; early childhood development; and health services (Dunn & Hayes, 1999). The latter encompass what is now referred to as the ‘social determinants of health’, a term initially used as an expansion of the environmental determinants of health outlined in the Lalonde Report (Lalonde, 1974; Blane, Brunner, & Wilkison, 1996). Since then, 12 key social determinants of health have been identified and defined as ‘the economic and social conditions that shape the health of individuals, communities, and jurisdictions as a whole’ (Raphael, 2009, p. 2).

A population health approach highlights the interrelationships among various determinants of health to provide a comprehensive understanding of the social phenomena that affect human health and wellbeing, such as the socio-behavioural implications of vaccine hesitancy. In fact, the conceptual framework presented in the WHO Commission on Social Determinants of Health (WHO, 2008b) was integrated in development of a guide for tailoring immunization programs (TIP; WHO, 2013). Specifically, the guide provides tools

to design evidence-informed responses to vaccine hesitancy based on the identification of subgroups of the population and of the salient factors that act as either promoters or barriers to vaccination among these individuals.

In response to a call for investigations on interrelationships of salient factors and determinants of vaccine hesitancy (Larson et al., 2014), recent studies have focused on providing a more comprehensive understanding of vaccine hesitancy using a multidimensional approach. For example, a study by Kumar et al. (2012) used the social ecological model (SEM; McLeroy et al., 1988) to highlight the interrelatedness of determinants associated with H1N1 influenza A vaccination across multiple levels (i.e., intrapersonal, interpersonal, institutional, community, and policy levels). Results from this study and other reviews of vaccine hesitancy (Dubé et al., 2013; Gowda & Dempsey, 2013) suggest that intervention strategies aimed at promoting vaccine receipt should be multidimensional and target determinants of vaccine decision-making and behaviour at multiple levels. Still, Kumar et al. (2012) indicate that both intrapersonal (e.g., individual attitudes and beliefs) and interpersonal (e.g., social norms) factors explain most of the variance in reported vaccine receipt.

In sum, a population health approach recognizes that the health of individuals is shaped by various determinants at multiple levels. Although the onus is often on the individual to be immunized against a vaccine-preventable disease to ensure community protection, factors influencing individual decision-making are embedded within the social determinants of health (WHO, 2008b). Thus, while it remains of crucial importance to recognize system barriers stemming from political and economic contexts, heightened public doubt in response to the widespread rhetoric of anti-vaccination movements and factors shaping individual risk perception are believed to play a predominant role in influencing

vaccination coverage when services and vaccines are available and accessible. With this in mind, a multifactor approach aimed at assessing the relative strength of influence factors involved in vaccine decision-making and behaviour can help identify and prioritize vaccine hesitant populations and subgroups and subsequently inform the design of evidence-based strategies to foster vaccine acceptance by incorporating elements at multiple levels.

Research Questions and Objectives

The complexity of vaccine hesitancy suggests that this phenomenon encompasses a variety of factors for which the strength of influence on vaccine acceptance varies across individuals. To date, the literature suggests that factors associated with vaccine hesitancy exert a relative strength of influence on vaccine decision-making and behaviour based on interrelationships among these factors and various determinants including contextual influences, individual/group influences, and vaccine-specific issues (WHO, 2014b; Larson et al., 2014; Dubé, Vivion, & MacDonald, 2015). In light of this, a call for research investigating the interrelationships among relevant factors of vaccine hesitancy and various contextual and individual/group determinants has recently been articulated (Larson et al., 2014). Specifically, Larson et al. (2011) state that ‘levels of public trust in vaccines are highly variable and context specific. To sustain or restore confidence in vaccines, a thorough understanding is needed of the population’s—or subpopulation’s—specific vaccine concerns, historical experiences, religious or political affiliation, and socioeconomic status’ (p. 526).

The literature on vaccine hesitancy is still in its infancy; in light of the novelty and limited understanding of this phenomenon, this study aimed to provide additional insight on factors associated with vaccine hesitancy and how these relate to vaccine receipt within a Canadian context. The overall objective of this thesis project was to examine the phenomenon of vaccine hesitancy in Canada and provide insight on the heterogeneity of vaccine hesitancy using a multi-factor approach.

The overarching research questions are listed below.

1. What are the attitudes and beliefs of Canadians with respect to vaccines and immunization, and do the latter differ across subgroups of the population?
2. Do relationships between dimensions of vaccine hesitancy and reported vaccine receipt differ across subgroups of the population?
3. What are salient factors associated with individual decision-making and behaviour in relation to vaccination?

The specific research objectives are listed below.

1. The first objective, which sought to answer the first research question, was to investigate a number of vaccine-related issues using a national sample of Canadian adults, and to determine whether levels of agreement with vaccine beliefs varied according to individuals' socio-demographic characteristics.
2. The second objective, which sought to answer the second research question, was to reduce the number of vaccine-related survey statements into fewer components of vaccine beliefs and to investigate relationships among the latter, socio-demographic characteristics, and reported receipt of the seasonal influenza vaccine.
3. The final objective, which sought to answer the third research question, was to explore perceptions of seasonal influenza immunization among a group of adults and identify salient factors associated with vaccine decision-making and behaviour that would inform future studies on adult influenza immunization. Qualitative research methods were employed to provide more in-depth insight that would complement quantitative survey findings.

**Chapter 2: Unpacking Vaccine Hesitancy in Canada: The Social Differentiation of
Vaccine Beliefs and Behaviours**

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Wilson, & Daniel Krewski.

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Abstract

Public perception of vaccines, particularly of their risks and benefits, are believed to play an important role in vaccine acceptance. The present study sought to identify differences in agreement with vaccine beliefs according to socio-demographic characteristics of Canadian adults and to determine whether these beliefs are associated with vaccine-related behaviours. A sample of 1,125 Canadian adults completed a subsection of a national health risk perception survey, asking them to rate their level of agreement with 21 vaccine beliefs statements and 2 statements assessing vaccine-related behaviours on a scale from 1 (do not agree at all) to 5 (agree completely). Overall, respondents' level of agreement with most belief statements indicated largely positive attitudes towards vaccination; however uncertainty about the long-term side effects of vaccination, including the perceived but unsubstantiated association between the MMR vaccine and autism, was also observed. Agreement with several belief statements was shown to differ according to respondents' age and educational attainment, with more positive attitudes towards vaccination observed among older and more educated respondents as compared to younger and less educated respondents, respectively. Finally, components of vaccine beliefs, as well as respondents' age and gender, were shown to significantly predict vaccine-related behaviours. The present findings provide valuable insight on the factors underlying heterogeneity of vaccine beliefs in Canada.

Key words: Risk perception vaccine hesitancy, beliefs, behaviours education, age, gender.

Introduction

Despite their tremendous public health benefits, vaccines are facing growing scrutiny among members of the public in many industrialized countries. Reports suggest that people are increasingly questioning the necessity, safety, and effectiveness of vaccines (Ritvo et al., 2003; Freed et al., 2010; Larson et al., 2011; LaVail & Kennedy, 2012; Dubé et al., 2013), and health authorities fear that heightened vaccine resistance could negatively impact current and future vaccination programs (Poland, Jacobson, & Ovsyannikova, 2009; Black & Rappuoli, 2010; MacDonald, Smith, & Appleton, 2012). While only a small proportion of individuals are estimated to have strong anti-vaccine convictions, a growing number of people are recognized as being hesitant towards vaccination (Leask, 2011; Leask et al., 2012; Larson, 2013). The term ‘vaccine hesitancy’ is increasingly used to depict vaccine resistance as a state of indecision that is influenced by numerous factors including issues of confidence (trust in vaccine and/or provider), complacency (perceived value and necessity of vaccines), and convenience (access to vaccination) (WHO, 2014). A multitude of determinants categorized as contextual influences (e.g., sociocultural and environmental factors), individual and group influences (e.g., personal and community perceptions, knowledge, attitudes and beliefs), and vaccine-specific issues (e.g., vaccine novelty, schedule, cost) also highlight the heterogeneity of vaccine hesitancy both across and within populations (Gowday & Dempsey, 2013; WHO, 2014).

In order to provide insight on varying degrees of vaccine hesitancy, a growing body of literature has examined the attitudes and beliefs of the general public that extend beyond parental compliance with childhood vaccinations (Ritvo et al., 2003; Larson et al., 2011; Velan et al., 2012; Smith, Appleton, & MacDonald, 2013; Dubé et al., 2013; Larson et al., 2014; Yaqub et al., 2014; Perreti-Watel et al., 2015). Several studies have sought to identify

'profiles' of vaccine hesitancy based on varying vaccine attitudes and beliefs across subgroups of the population (Prislin et al., 1998; Opel et al., 2011a; 2011b; Velan et al., 2012; Lavail & Kennedy, 2012; Leask et al., 2012; Gowda & Dempsey, 2013). Vaccine hesitancy is characterized as complex and context-specific (WHO, 2014), resulting in mixed findings on the influence of determinants such gender, education, and socio-economic status on vaccine hesitancy and subsequent vaccine uptake (Larson et al., 2014; WHO, 2014; Dubé, Vivion, & MacDonald, 2015). As a result, the interrelationships among factors associated with vaccine hesitancy, socio-demographic characteristics such as gender, age, and education, and vaccine receipt remains unclear.

In Canada, only a few studies have sought to provide a population-based account of vaccine attitudes and beliefs. In 2002, a survey of 1,057 Canadians found that women were less knowledgeable and more frequently undecided about vaccination compared to men, and that higher educational attainment was associated with more positive vaccine attitudes (Ritvo et al., 2003). Another national survey on public risk perception in Canada found that individuals with lower educational attainment reported higher levels of perceived risk associated with vaccines compared to individuals with higher educational attainment (Krewski et al., 2006). Public perception of risk has been identified as an important factor in vaccine decision-making and behaviour (Ball, Evans, & Bostrom, 1998; Chen, 1999; Streefland, 2001; Gust et al., 2003; Weinstein et al., 2007; Brewer et al., 2007; Cooper, Larson, & Katz, 2008; Freed et al., 2010; Nguyen et al., 2011; Gidengil, Parker, & Zikmund-Fisher, 2012; MacDonald, Smith, & Appleton, 2012; Larson, Paterson, & Erondy, 2012). In fact, a recent review identified concerns with vaccine safety as the most common reason for vaccine hesitancy among members of the general public (Yaqub et al., 2014). Notably, heightened public concern about the adverse effects of the Measles-Mumps-Rubella (MMR)

vaccine was associated with lower immunization rates, resulting in measles outbreaks in several European countries, notably in the United Kingdom, which eventually spread to North America. In 2011, Quebec experienced the largest measles outbreak in North America in a decade with more than 725 cases of measles reported (De Serres et al., 2013), and outbreaks in several other Canadian provinces subsequently occurred (PHAC, 2014).

Perceived risks associated with vaccines and vaccine-preventable diseases remain a driving force underlying vaccine hesitancy, with aspects related to risk perception, including uncertainty (about the risk), control (over risk exposure), novelty (of the risk), dreadfulness (of the consequences), as well as social norms that guide opinions about vaccination forming the basis for complexity in vaccine decision-making (Ball, Evans, & Bostrom, 1998; Tickner, Leman, & Woodcock, 2006; Betsch et al., 2011; Gidengil, Parker, & Zikmund-Fisher, 2012; Brunson, 2013; Opel & Marcuse, 2013; Leask, Willaby, & Kaufman, 2014). Importantly, personal and societal factors, including socio-demographic characteristics, worldviews, attitudes, and beliefs are also considered important aspects affecting public risk perception (Slovic, 1999; Sjöberg, 2000; Bouyer et al., 2001; Lee et al., 2005; Krewski et al., 2008; 2012). Levels of perceived risk among members of the Canadian general public have been shown to vary based on individual characteristics including age, gender, and education (Krewski et al., 2006). In light of this, recent surveys have included “health belief statements” assessing the role of dimensions of perceived risk, risk acceptability, uncertainty, social norms, and control with respect to specific hazards to provide additional insight on individual differences in public risk perception (Krewski et al., 1995a, 1995b, 2006, 2008, 2009; Lee et al., 2005; 2008; Lemyre et al., 2006).

In a similar vein, the present study aimed to assess the attitudes and beliefs of individuals in Canada with respect to vaccines and immunization and to identify differences in vaccine acceptance according to socio-demographic characteristics.

Methods

Survey Content

A third iteration of a national health risk perception survey was designed to assess public risk perception in Canada (Krewski et al., 1995a; 1995b, 2006; 2008; 2009; 2012; Lee et al., 2005; 2008; Lemyre et al., 2006). A subsection of this survey was designed to assess respondents' level of agreement with 2 statements addressing vaccine behaviours and 21 statements addressing beliefs about vaccines, vaccine science, risk acceptability, uncertainty, perceived risk, and internal (i.e., individual responsibility) and external (i.e., the role of regulators) control. Out of the 21 vaccine belief statements, 5 statements were selected from the 'common vaccine misconceptions' identified by the Centre for Disease Control and Prevention (CDC), the World Health Organization (WHO), and Health Canada (CDC, 1999; 2007; Health Canada, 2011; WHO, 2015). Respondents were asked to rate their level of agreement with these statements on a Likert scale ranging from 1 to 5 (1 = do not agree at all, 2 = agree a little bit, 3 = agree somewhat, 4 = agree quite a bit, 5 = agree completely). Respondents could also indicate if they did not know or had no opinion (99 = don't know/no opinion). The survey was translated from English to French by a professional translator and verified by the researchers for linguistic equivalency of terms and concepts. Prior to its implementation, the study protocol was reviewed and approved by the Research Ethics Board of the University of Ottawa and the survey instrument was pre-tested with a group of volunteers.

Survey Recruitment

Ekos Research Associates, a professional survey research firm based in Ottawa, Canada and member of the Marketing Research and Intelligence Association (MRIA) of Canada, designed the sampling procedures and administered the survey. Population sampling for the survey relied on a Probit™ panel comprised of Canadian adults recruited from a blended landline and cell-phone (i.e., full coverage) sampling frame using a random digit dial sampling process. The recruitment process was designed to yield samples that are representative of the Canadian population according to gender, age, and region (based on the 2011 Canadian Census). As such, the incidence of a given target population within the panel very closely resembles the public at large.

Two separate and independent samples were selected from the Probit™ panel that includes Canadians who have Internet access and those who do not (approximately 15% of the Canadian population). Respondents in a first sample were selected from a Probit™ panel comprised of Canadian adults aged 18 or older with a telephone number and residing in one of the 10 Canadian provinces, and completed the survey via computer-assisted telephone interviews (CATI). A parallel sample was selected from the roughly 85% of Probit™ panel members who have Internet access, with respondents completing the survey online via a secure web-based server. One third of respondents from both samples were randomly assigned to complete one of three subsections of the survey pertaining to vaccines, radiation, or emergency preparedness. The online and CATI surveys were administered in both official languages (English and French). Responses were obtained between June 1st and August 20th 2012.

Survey Sample

A total of 3,263 Canadian adults completed the overall risk perception survey: 1, 694 respondents completed the survey via CATI, and 1,569 respondents completed the survey online. The response rates for the CATI and online survey were 22% and 10%, respectively. Statistical comparisons between the two survey methods indicated that there were no significant differences between the online and CATI surveys (Yong et al., 2013). Homogeneity of variance between the CATI and online samples was confirmed and the two datasets were merged. The stratified sampling procedure yielded a sample that closely approximated the Canadian general population with respect to age, gender and region. Descriptive analyses performed on the total sample weighted by age, gender, region, and age did not produce different results from the analyses performed on the un-weighted sample. Accordingly, weights were not employed in the analyses undertaken with the subsample of respondents that completed the vaccine-related subsection of the survey.

Analyses were performed on a subsample of 1,125 Canadian adults of at least 18 years of age (combined CATI and online respondents) representing all respondents that completed the vaccine-related subsection of the survey (see Appendix A)¹. The final sample was comprised of a similar proportion of men (49.8%) and women (50.2%), and 39.9% of younger adults (≤ 44 years old) and 60.1% of older adults (≥ 45 years old). A total of 17.7% of respondents had at most a high school education, 23.6% had at least a college or CEGEP-level education, 37.3% had a university (i.e. bachelor's) education and 20.7% had a graduate-level education. Finally, 23.7% of respondents were parents with at least one child

¹ Approximately one third of respondents from the CATI and online samples were randomly selected to complete the subsection of the survey on vaccines and immunization.

aged 16 or younger², and 76.3% of respondents were non-parents or parents with at least one child aged 17 or older.

Statistical Analyses

Descriptive analyses were initially conducted to assess respondents' overall level of agreement with the 2 vaccine-related behaviour statements and the 21 vaccine-related belief statements.

Multinomial logistic regressions were conducted to investigate differences in responses to statements with > 10% 'do not know/no opinion' responses. Responses differences were examined according to respondents' gender (men vs. women), age (younger vs. older adults), education (without university education vs. with university education), and parental status (parent with at least one child aged 16 or younger vs. others). Multinomial logistic regression models included all socio-demographic variables of interest (i.e. gender, age, education, and parent status) as predictor variables and the statements of interest as the outcome variable. The response category 'don't know/no opinion' was set as the reference category.

A principal components analysis (PCA) was performed to reduce the number of vaccine-related belief statements into fewer meaningful components in order to: a) conduct a series of multivariate analyses of variance (MANOVAs) to identify differences in patterned responses (i.e., level of agreement) with highly correlated vaccine belief statements; b) create components scores that account for a maximal amount of variance to be used as

² Parents with at least one child aged 16 or younger were distinguished from other respondents based on Medical Consent of Minors Act (ULCC, 2015).

predictor variables in multiple linear regression analyses with vaccine-related behaviour statements as the outcome variables (Suhr, 2005).

A series of MANOVAs were conducted to identify differences in responses to groups of correlated statements identified from the PCA according to respondents' gender (men vs. women), age (younger vs. older adults), education (without university education vs. with university education), and parental status (parent with at least one child aged 16 or younger vs. others). 'Don't know/no opinion' responses were treated as missing values.

Hierarchical linear regressions were conducted to determine whether both components significantly predicted respondents' level of agreement with vaccine-related behaviour statements, after controlling for socio-demographic variables. Socio-demographic variables of interest (i.e., gender, age, education, and parental status)³ were entered in the first step, and components of vaccine beliefs were entered in the second step of the hierarchical regression model. Components scores were calculated using a 'standardized weighted sum of scores' method, whereby each item was standardized, multiplied by its respective loading value, and summed with other items (i.e., items loading onto the same component) (Tabachnick & Fidell, 2007; DiStefano et al., 2009).

All statistical analyses were performed using SPSS version 22.

Results

Responses to the 2 statements assessing vaccine-related behaviours and the 21 vaccine-related belief statements are presented in Table 1. Responses indicate that respondents are divided with respect to reported receipt of the seasonal influenza vaccine

³ Age and education variables included in the regression models had interval-level measurement properties as depicted in Appendix A.

and that most adults report discussing vaccine-related information with others. A majority of respondents indicated disagreement and low-to-moderate agreement with many ‘common vaccine misconceptions’ and other negative vaccine beliefs; however, predominant moderate to strong agreement with statements referring to vaccine side effects suggest that many Canadian adults are concerned about the potential adverse effects of vaccination. Responses also indicate a heightened uncertainty about the negative effects associated with a vaccine that protects against more than one disease, and the purported link between the MMR vaccine and autism, as indicated by a relatively high proportion of ‘don’t know/no opinion’ responses to these statements. In addition, while most respondents showed strong agreement with the notion that vaccine decision-making is an individual responsibility, respondents also strongly endorsed the role of external regulators (e.g., government health authorities and public organizations) in ensuring the availability of vaccines and facilitating access to vaccination campaigns in schools and workplaces.

Table 1. Responses (%) to the Vaccine-Related Subsection of the Survey (N = 1,125)

Survey Statements	Moderately Agree			Strongly Agree		Don't know/no opinion
	Do not agree at all	Agree a little	Agree somewhat	Agree quite a bit	Agree completely	
Behaviours						
<i>I discuss with others the information I get on vaccines.</i>	13.4	21.4	26.0	21.0	17.0	1.2
<i>I usually get the seasonal flu vaccine.</i>	42.8	8.2	6.6	9.7	33.3	0.5
Beliefs						
Vaccines						
<i>Vaccines can cause many harmful side effects, illnesses, and even death.</i>	20.0	34.1	19.8	10.5	12.1	3.6
<i>The Measles-Mumps-Rubella vaccine can cause autism.</i>	42.8	13.4	7.3	4.4	3.2	28.8
<i>A vaccine that protects against several diseases is more likely to cause serious side effects.</i>	28.6	22.7	17.8	7.8	5.3	17.8
<i>Vaccines weaken the immune system.</i>	48.1	19.0	13.9	7.3	4.8	6.9
<i>Diseases that can be prevented by vaccines have been virtually eliminated in Canada.</i>	14.9	17.5	23.4	26.2	13.8	4.2
<i>Vaccines provide complete and long-term immunization against diseases.</i>	20.4	19.9	27.6	21.5	8.5	2.0
<i>Vaccines are not necessary because diseases cure themselves naturally.</i>	66.9	16.0	9.8	3.9	1.5	1.9
<i>Vaccination only benefits people who have been vaccinated.</i>	46.6	14.0	13.4	11.6	11.6	2.9
Science						
<i>Science and technology help to ensure that vaccines are safe.</i>	2.8	11.1	20.9	36.4	27.9	1.0
<i>Scientists usually agree about the risks associated with vaccines.</i>	16.8	20.8	27.3	22.1	8.4	4.6
Risk Perception						
<i>I am concerned about the safety of vaccines.</i>	30.5	26.4	16.6	12.0	14.1	0.4

<i>It is unlikely that I will experience serious side effects from a vaccine.</i>	13.4	18.0	18.7	25.8	20.9	3.2
<i>The benefits of vaccines outweigh the risks.</i>	5.3	6.6	21.1	29.4	35.8	1.8
<i>Risk Acceptability</i>						
<i>Getting sick from a disease is more acceptable to me than getting sick from a vaccine.</i>	40.7	14.7	17.0	13.2	12.0	2.4
<i>Even if I didn't understand why, I would likely follow the advice from government authorities to get the recommended vaccine.</i>	22.8	18.3	22.9	24.6	10.8	0.6
<i>Uncertainty</i>						
<i>It is difficult to predict the long-term effects of vaccines.</i>	12.0	22.5	24.3	21.7	16.8	2.8
<i>Information about vaccines is confusing.</i>	22.0	28.3	26.3	13.8	8.4	1.2
<i>Social Norms</i>						
<i>When the people I like worry about vaccines I am more likely to worry as well.</i>	38.9	24.4	17.0	11.8	7.5	0.4
<i>Internal Control</i>						
<i>I am responsible for making the decision to get vaccinated.</i>	2.3	3.3	7.5	20.6	65.9	0.4
<i>External Control</i>						
<i>It is the government's responsibility to ensure the availability of vaccines for Canadians.</i>	2.5	2.9	10.7	31.1	52.0	0.8
<i>Organizations such as workplaces and schools should facilitate vaccination campaigns.</i>	7.2	8.7	21.8	27.9	33.1	1.3

Multinomial Logistic Regressions

A high percentage of respondents selected ‘don’t know/opinion’ in response to the belief statements ‘The Measles-Mumps-Rubella vaccine can cause autism’ and ‘A vaccine that protects against several diseases is more likely to cause serious side effects’. In light of this, multinomial logistic regression analyses were performed to determine whether responses to the statements differed according to respondents’ gender, age, education, and parental status. Significant odds ratios (OR) with 95% confidence intervals (CI) are reported below.

Results indicated that responses to the statement ‘The Measles-Mumps-Rubella vaccine can cause autism’ differed according to respondents’ gender, $\chi(2) = 19.83$, $p < 0.01$, and education, $\chi(2) = 47.10$, $p < 0.001$. Specifically, women were more likely to select the response categories ‘do not agree at all’, OR = 0.67 (CI: 0.50 to 0.90), $p < 0.01$, or ‘agree quite a bit’, OR = 0.43 (CI: 0.23 to 0.82), $p < 0.05$, as opposed to ‘don’t know/no opinion’, whereas the opposite was true for men. In addition, respondents with a university education were more likely to respond with ‘do not agree at all’, OR = 0.47 (CI: 0.35 to 0.64), $p < 0.001$, as opposed to ‘don’t know/no opinion’, whereas the opposite was true for respondents without a university education.

Results also indicated that responses to the statement ‘A vaccine that protects against several diseases is more likely to cause serious side effects’ differed according to respondents’ education, $\chi(2) = 65.74$, $p < 0.001$, and parental status, $\chi(2) = 15.59$, $p < 0.01$. Specifically, respondents with a university education were more likely to select the response category ‘do not agree at all’, OR = 0.63 (CI: 0.43 to 0.92), $p < 0.05$, as opposed to ‘don’t know/no opinion’, whereas the opposite was true for respondents without a university education. In turn, respondents without a university education were more likely to select the

response categories ‘agree somewhat’, OR = 1.66 (CI: 1.11 to 2.48), $p < 0.05$, ‘agree quite a bit’, OR = 1.98 (CI: 1.18 to 3.32), $p < 0.05$, or ‘agree completely’, OR = 5.00 (CI: 2.55 to 9.79), $p < 0.001$, rather than ‘do not know/no opinion’, whereas the opposite was true for respondents with a university education. Finally, results also indicated that parents with at least one child aged 16 or less were more likely to select the response category ‘agree a little’, OR = 1.79 (CI: 1.13 to 2.83), $p < 0.05$, rather than ‘don’t know/no opinion’, whereas the opposite was true for all other respondents (i.e., non-parents and parents with at least one child over the age of 16).

Components of Vaccine Beliefs

A principal component analysis (PCA) with list wise deletion of cases⁴ was performed to reduce 19 vaccine-related belief statements (excluding belief statements for which >10% of respondents selected the response category ‘don’t know/know opinion’) into a set of meaningful components accounting for an appreciable proportion of the total observed variance in responses. An initial non-rotated solution produced 4 components with eigenvalues greater than 1 and accounted for 51.07% of the total variance in the data; however, the scree test indicated that a 2-component solution be retained (Costello & Osborne, 2005). A subsequent PCA with 2 components was conducted with direct oblimin rotation⁵ to enhance the interpretability of components. Examination of the pattern matrix indicated that two items did not produce loading values above 0.40; thus, a final PCA was conducted excluding these two items (i.e., ‘I am responsible for making the decision to get vaccinated’ and ‘Vaccination only benefits people who have been vaccinated’). This final 2-

⁴ ‘Don’t know/no opinion’ responses were treated as missing values.

⁵ Direct oblimin was the preferred rotation in light of significant correlations among most vaccine-related belief statements, indicating that components were likely to be correlated as well.

component solution, including 17 vaccine-related belief statements, accounted for 43.2% of the total variance in the data (see Table 2). The first component accounted for 30.6% of the total variance and included 8 statements pertaining to beliefs about vaccine safety. The second component accounted for 12.7% of the total variance and included 9 statements pertaining to beliefs about the regulation and benefits of vaccines.

Table 2: Principal components analysis with 17 vaccine-related belief statements (N = 896)

Statements	Mean Score (SD)	C1	C2
Vaccines weaken the immune system.	1.92 (1.17)	0.74	-0.06
I am concerned about the safety of vaccines.	2.43 (1.37)	0.73	-0.13
When the people I like worry about vaccines I am more likely to worry as well.	2.17 (1.25)	0.67	0.16
Information about vaccines is confusing.	2.51 (1.19)	0.64	-0.08
Vaccines are not necessary because diseases cure themselves naturally.	1.53 (0.91)	0.64	0.04
It is difficult to predict the long-term effects of vaccines.	3.04 (1.28)	0.64	-0.05
Vaccines can cause many harmful side effects, illnesses, and even death.	2.55 (1.26)	0.63	-0.14
Getting sick from a disease is more acceptable to me than getting sick from a vaccine.	2.37 (1.42)	0.61	0.09
Science and technology help to ensure that vaccines are safe.	3.83 (1.03)	-0.21	0.69
Even if I didn't understand why, I would likely follow the advice from government authorities to get the recommended vaccine.	2.88 (1.30)	-0.09	0.66
Organizations such as workplaces and schools should facilitate vaccination campaigns.	3.79 (1.18)	-0.14	0.65
Scientists usually agree about the risks associated with vaccines.	2.89 (1.20)	0.04	0.64
It is the government's responsibility to ensure the availability of vaccines for Canadians.	4.28 (0.93)	0.03	0.56
The benefits of vaccines outweigh the risks.	3.91(1.12)	-0.45	0.55
Vaccines provide complete and long-term immunization against diseases.	2.82 (1.24)	0.07	0.53
It is unlikely that I will experience serious side effects from a vaccine.	3.30 (1.33)	-0.21	0.47
Diseases that can be prevented by vaccines have been virtually eliminated in Canada.	3.10 (1.28)	0.18	0.47
Percent variance	---	30.56	12.67

NOTE: C1 = Beliefs about vaccine safety; C2 = Beliefs about vaccine regulation and benefits

Multivariate Analyses of Variance

A series of between-subject multivariate analyses of variance (MANOVAs) were performed in order to examine whether respondents' level of agreement with negative belief statements about vaccine safety, and positive belief statements about the regulation and benefits of vaccines differed according to gender, age, education, and parental status. Statements used as outcome variables were significantly correlated with each other, although correlations did not exceed 0.5. Differences in levels of agreement with survey statements were investigated between men and women, younger (<44 years old) and older (45+ years old) respondents, respondents with and without a university education⁶, and parents with at least one child aged 16 or younger and all other respondents (i.e., parents with at least one child >16 years old and non-parents). A significance level of $p < 0.01$ was used in interpreting results of the MANOVAs.

Beliefs About Vaccine Safety

Table 3 show the mean responses to belief statements about vaccine safety. Overall, respondents were in disagreement or low to moderate agreement with these beliefs statements, reflecting positive attitudes towards vaccines. In particular, disagreement with the statement 'Vaccines are not necessary because diseases cure themselves naturally' reflect respondents' positive view on the necessity of vaccines. The overall mean response to the statement 'It is difficult to predict the long-term side effects of vaccines' represents the

⁶ A *post-hoc* Tukey test showed no difference in mean responses to statements within both components between respondents with a high school and college education, and between respondents with a university and graduate education

highest rating of agreement, indicating respondents' heightened uncertainty about the potential long-term adverse effects resulting from vaccination.

Respondents' agreement with belief statements about vaccine safety varied by age, $V = 0.04$, $F(8, 949) = 4.57$, $p < 0.001$, and education, $V = 0.08$, $F(8,945) = 9.88$, $p < 0.001$. Specifically, younger respondents reported stronger levels of agreement with the statements 'Vaccines can cause many harmful side effects, illnesses, and even death', $F(1, 956) = 14.61$, $p < 0.001$, 'Vaccines are not necessary because diseases cure themselves naturally', $F(1, 956) = 16.47$, $p < 0.001$, and 'Getting sick from a disease is more acceptable than getting sick from a vaccine', $F(1, 956) = 18.89$, $p < 0.01$, compared to older respondents. In addition, respondents without a university education reported stronger levels of agreement with all statements pertaining to beliefs about vaccine safety compared to respondents with a university education. Specifically, respondents without a university education reported stronger levels of agreement with the statements 'Vaccines weaken the immune system', $F(1, 952) = 40.55$, $p < 0.001$; 'I am concerned about the safety of vaccines', $F(1, 952) = 34.26$, $p < 0.001$; 'When the people I like worry about vaccines I am more likely to worry as well', $F(1, 952) = 38.90$, $p < 0.001$; 'Information about vaccines is confusing', $F(1, 952) = 43.05$, $p < 0.001$; 'Vaccines are not necessary because diseases cure themselves naturally', $F(1, 952) = 24.57$, $p < 0.001$; 'It is difficult to predict the long-term effects of vaccines', $F(1, 952) = 33.19$, $p < 0.001$; 'Vaccines can cause many harmful side effects, illnesses, and even death', $F(1, 952) = 22.75$, $p < 0.001$; and 'Getting sick from a disease is more acceptable than getting sick from a vaccine', $F(1, 952) = 23.81$, $p < 0.001$.

Table 3. Mean scores for belief statements about vaccine safety (standard deviation shown in parentheses).

Statement	Overall	Gender		Age*	Education*	Parent			
		Men	Women	<44 yrs old 45+ yrs old	No University University	Yes No			
Vaccines weaken the immune system.	1.94 (1.20)	1.94 (1.16)	1.95 (1.23)	2.04 (1.22)	1.87 (1.18)	2.22 (1.30)	1.73 (1.06)	1.89 (1.13)	1.96 (1.22)
I am concerned about the safety of vaccines.	2.53 (1.40)	2.41 (1.36)	2.53 (1.43)	2.54 (1.42)	2.42 (1.37)	2.77 (1.42)	2.24 (1.32)	2.58 (1.42)	2.43 (1.38)
When the people I like worry about vaccines I am more likely to worry as well.	2.24 (1.29)	2.14 (1.20)	2.25 (1.34)	2.30 (1.33)	2.13 (1.23)	2.49 (1.37)	1.98 (1.14)	2.26 (1.28)	2.18 (1.27)
Information about vaccines is confusing.	2.58 (1.22)	2.50 (1.15)	2.54 (1.26)	2.50 (1.18)	2.53 (1.23)	2.82 (1.25)	2.31 (1.13)	2.56 (1.23)	2.51 (1.20)
Vaccines are not necessary because diseases cure themselves naturally.	1.54 (0.93)	1.60 (0.98)	1.50 (0.91)	1.70 (1.03)	1.45 (0.88)	1.72 (1.03)	1.42 (0.84)	1.62 (0.98)	1.53 (0.94)
It is difficult to predict the long-term effects of vaccines.	3.09 (1.28)	3.00 (1.23)	3.11 (1.34)	3.07 (1.31)	3.04 (1.27)	3.34 (1.26)	2.86 (1.26)	3.07 (1.33)	3.05 (1.27)
Vaccines can cause many harmful side effects, illnesses, and even death.	2.59 (1.28)	2.55 (1.22)	2.60 (1.35)	2.77 (1.32)	2.44 (1.24)	2.80 (1.30)	2.40 (1.24)	2.64 (1.32)	2.55 (1.27)
Getting sick from a disease is more acceptable than getting sick from a vaccine.	2.40 (1.44)	2.40 (1.43)	2.35 (1.44)	2.55 (1.45)	2.26 (1.42)	2.65 (1.45)	2.20 (1.40)	2.48 (1.45)	2.35 (1.43)

No University: at most some/completed college or high school

University: at least some/completed graduate school or university

Parent: Yes = parent with a child 16 years or younger; No = all other respondents

* = significant differences

Beliefs About Vaccine Regulation and Benefits

Table 4 demonstrates respondents' level of agreement with belief statements about vaccines regulation and benefits. Overall, respondents' agreement with these beliefs statements was moderate to strong, indicating largely positive attitudes regarding the benefits of vaccines and the role of vaccine regulators. In particular, respondents reported stronger agreement with the statements 'The benefits of vaccines outweigh the risks' and 'Science and technology help to ensure that vaccines are safe'. Respondents reported the strongest agreement with the statement 'It is the government's responsibility to ensure the availability of vaccines for Canadians', indicating overall support for the government's role in ensuring the availability of vaccines in Canada.

Respondents' agreement with belief statements about vaccines regulation and benefits varied by age, $V = 0.03$, $F(9, 973) = 3.49$, $p < 0.001$, and education, $V = 0.08$, $F(9, 971) = 5.00$, $p < 0.001$. Specifically, older respondents reported stronger agreement with the statement 'Even if I didn't understand why, I would likely follow the advice from government authorities to get the recommended vaccine', $F(1, 981) = 17.40$, $p < 0.001$, compared to younger respondents. In addition, respondents with a university education reported stronger agreement with the statements 'Science and technology help to ensure that vaccines are safe', $F(1, 979) = 8.33$, $p < 0.01$, 'The benefits of vaccines outweigh the risks', $F(1, 979) = 20.41$, $p < 0.001$, and 'It is unlikely that I will experience serious side effects from a vaccine', $F(1, 979) = 15.20$, $p < 0.001$, compared to respondents without a university education.

Table 4. Mean scores for beliefs about vaccine regulation and benefits (standard deviation shown in parentheses).

Statement	Overall	Gender	Age*	Education*	Parent
		Men Women	<44 yrs old 45+ yrs old	No University University	Yes No
Science and technology help to ensure that vaccines are safe.	3.76 (1.07)	3.83 (1.01) 3.79 (1.07)	3.78 (1.09) 3.83 (1.01)	3.69 (1.07) 3.89 (1.01)	3.77 (1.10) 3.82 (1.02)
Even if I didn't understand why, I would likely follow the advice from government authorities to get the recommended vaccine.	2.82 (1.32)	2.92 (1.26) 2.82 (1.35)	2.66 (1.26) 3.02 (1.32)	2.88 (1.30) 2.87 (1.31)	2.66 (1.25) 2.94 (1.32)
Organizations such as workplaces and schools should facilitate vaccination campaigns.	3.72 (1.22)	3.77 (1.17) 3.78 (1.20)	3.68 (1.23) 3.83 (1.15)	3.69 (1.21) 3.83 (1.16)	3.61 (1.24) 3.82 (1.16)
Scientists usually agree about the risks associated with vaccines.	2.84 (1.22)	2.90 (1.19) 2.85 (1.22)	2.95 (1.22) 2.82 (1.19)	2.86 (1.20) 2.88 (1.21)	2.83 (1.20) 2.88 (1.20)
It is the government's responsibility to ensure the availability of vaccines for Canadians.	4.28 (0.95)	4.25 (0.92) 4.35 (0.93)	4.32 (0.92) 4.28 (0.93)	4.27 (0.94) 4.32 (0.92)	4.26 (0.98) 4.31 (0.91)
The benefits of vaccines outweigh the risks.	3.85 (1.15)	3.94 (1.08) 3.85 (1.16)	3.84 (1.17) 3.93 (1.09)	3.71 (1.15) 4.03 (1.07)	3.87 (1.11) 3.90 (1.12)
Vaccines provide complete and long-term protection against diseases.	2.77 (1.25)	2.71 (1.19) 2.87 (1.28)	2.71 (1.24) 2.85 (1.23)	2.89 (1.23) 2.73 (1.24)	2.79 (1.24) 2.79 (1.24)
It is unlikely that I will experience serious side effects from a vaccine.	3.23 (1.35)	3.33 (1.31) 3.22 (1.36)	3.25 (1.34) 3.29 (1.33)	3.07 (1.30) 3.41 (1.34)	3.19 (1.34) 3.30 (1.33)
Diseases that can be prevented by vaccines have been virtually eliminated in Canada.	3.07 (1.29)	3.00 (1.28) 3.16 (1.28)	3.09 (1.22) 3.08 (1.32)	3.08 (1.23) 3.08 (1.32)	3.18 (1.24) 3.05 (1.29)

No University: at most some/completed college or high school

University: at least some/completed graduate school or university

Parent: Yes = parent with a child 16 years or younger; No = all other respondents

* = significant differences

Separate MANOVAs performed to test for an interaction between age and education yielded non-significant results, indicating that the effects of age were not modified by education and vice versa.

Components Scores

In order to determine whether vaccine-related belief statements predicted respondents' level of agreement with the 2 statements assessing vaccine-related behaviours (i.e., 'I discuss with others the information I get on vaccines' and 'I usually get the seasonal flu vaccine'), components scores were computed for and used as predictor variables in hierarchical regression models with vaccine-related behaviour statements as the outcome variable. In light of a cross-loading for the statement 'The benefits of vaccines outweigh the risks' (i.e., this statement also loaded onto the first component with a value >0.40), a PCA was conducted without this statement in the model. Components scores were therefore computed based on results of this new 2-component solution, which included 16 vaccine-related belief statements (see Appendix B). Components were interpreted as 'concern about vaccine safety' (C1) and 'vaccine regulation and benefits' (C2) and produced a Cronbach's alpha of 0.83 and 0.75, respectively, indicating good internal consistency among the statements within each component. The PCA was performed with a subsample of 900 respondents due to a listwise deletion of missing values (i.e., 'do not know/no opinion' responses) (see Appendix C).

Hierarchical Linear Regressions

Results of the hierarchical linear regression analyses indicate that beliefs reflecting ‘concern about vaccine safety’ and ‘vaccine regulation and benefits’ significantly predicted vaccine-related behaviours.

A first regression analysis revealed that after controlling for socio-demographic variables in the first step, the final model significantly predicted reported discussion of vaccine-related information with others, $R^2 = 0.11$, $F(6, 881) = 18.60$, $p < 0.001$. Predictors accounted for 11.0% of adjusted variance in reported receipt of the seasonal influenza vaccine. The change in R after Step 1 was 0.08, $\Delta F(2, 881) = 40.79$, $p < 0.001$, indicating that the addition of both components of vaccine beliefs into the model added significantly to the prediction of reported discussion about vaccine-related information with others. The unstandardised regression coefficients (B) and standardized regression coefficients (β) observed in analyses of reported discussions about vaccine-related information are presented in Table 5.

Table 5. Hierarchical linear regression identifying predictors of the statement ‘I discuss with others the information I get on vaccines’ (N = 888)

Variable	<i>B (SE)</i>	β
<i>Step 1</i>		
Gender	0.31 (0.09)	0.12***
Age	-0.07 (0.03)	-0.09*
Education	-0.02 (0.04)	-0.02
Parental status	-0.18 (0.11)	-0.06
<i>Step 2</i>		
Gender	0.29 (0.08)	0.11***
Age	-0.05 (0.03)	-0.06
Education	0.08 (0.04)	0.06
Parental status	-0.22 (0.10)	-0.07*
Concern about Vaccine Safety (C1)	0.11 (0.01)	0.30***
Vaccine Regulation and Benefits (C2)	0.10 (0.02)	0.21***

$R^2 = 0.03$ for Step 1 ($p < 0.001$), $\Delta R^2 = 0.08$ for Step 2 ($p < 0.001$)

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

A second regression analysis revealed that after controlling for socio-demographic variables in the first step, the final model significantly predicted reported receipt of the seasonal influenza vaccine, $R^2 = 0.31$, $F(6, 881) = 65.56$, $p < 0.001$. Predictors accounted for 30.0% of adjusted variance in reported receipt of the seasonal influenza vaccine. The change in R after Step 1 was 0.19, $\Delta F(2, 885) = 122.45$, $p < 0.001$, indicating that the addition of both components of vaccine beliefs into the model added significantly to the prediction of reported receipt of the seasonal influenza vaccine. The un-standardised regression coefficients (B) and standardized regression coefficients (β) observed in analyses of reported discussions about vaccine-related information are presented in Table 6.

Table 6. Hierarchical linear regression identifying predictors of the statement ‘I usually get the seasonal flu vaccine’ (N = 892)

Variable	<i>B (SE)</i>	β
<i>Step 1</i>		
Gender	0.09 (0.11)	0.03
Age	0.37 (0.04)	0.32***
Education	0.12 (0.06)	0.07*
Parental status	0.20 (0.14)	0.05
<i>Step 2</i>		
Gender	0.05 (0.10)	0.02
Age	0.31 (0.04)	0.27***
Education	-0.03 (0.05)	-0.01
Parental status	0.13 (0.12)	0.03
Concern about Vaccine Safety (C1)	-0.11 (0.02)	-0.21***
Vaccine Regulation and Benefits (C2)	0.20 (0.02)	0.32***

$R^2 = 0.12$ for Step 1 ($p < 0.001$), $\Delta R^2 = 0.19$ for Step 2 ($p < 0.001$)

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Discussion

The aims of the present study were to 1) assess Canadians' level of agreement with vaccine-related behaviour and belief statements, 2) determine whether agreement with vaccine-related belief statements differed according to socio-demographic characteristics, and 3) investigate the relationship between components of vaccine beliefs and reported behaviours. To our knowledge, only one national survey previously assessed Canadians' attitudes about vaccines and immunization (Ritvo et al., 2003). Findings from the aforementioned survey, conducted in 2002, characterized Canadians as having mostly positive opinions about vaccine effectiveness and research; however, certain responses suggested a lack of knowledge about vaccines. In addition, perceived vaccine safety, effectiveness, and knowledge were shown to significantly predict individuals' willingness to receive a vaccine (Ritvo et al., 2003).

Results from the present survey appear to be more complex. Responses to many survey statements suggest that Canadian adults demonstrate positive attitudes towards vaccines and vaccine regulators; however, heightened concern and uncertainty about adverse events, particularly long-term vaccine side effects, was also apparent. Respondents' overall disagreement and only low-to-moderate agreement with many negative vaccine belief statements and moderate to strong agreement with positive beliefs statements about vaccines and vaccine regulators was indicative of positive attitudes towards vaccination. Results also revealed that most Canadian adults value the necessity of vaccines and believe that immunization goes beyond individual protection, reflecting an appreciation of herd immunity (Fine, Emes, & Heymann, 2011).

Still, the majority of respondents agreed with the notions that vaccines can cause harmful side effects, that it is difficult to predict long-term side effects of vaccines, and that

information about vaccines is confusing. In addition, a high proportion of respondents indicated that they did not know and/or had no opinion about the proposed link between the MMR vaccine and the development of autism, and whether a vaccine that protects against several diseases is more likely to cause serious side effects, demonstrating heightened uncertainty among Canadian adults about these claims. Previous reports suggest that the Wakefield et al. (1998) article linking the MMR vaccine to childhood autism has had lasting effects on the public's perception of vaccines (Tickner, Leman, & Woodcock, 2006; Poland & Spier, 2010). What remains concerning however, is that the public's uncertainty about the alleged link between the MMR vaccine and autism persists despite evidence disproving this claim (Wilson et al., 2003; Editors of The Lancet, 2010; Jain et al., 2015).

Differences in agreement with two 'common vaccine misconceptions' were identified based on gender, educational attainment, and parental status. Specifically, men and respondents without a university education were more likely to report not knowing and/or having no opinion about the notion that the MMR vaccine can cause autism, whereas women were more likely to either agree or disagree and respondents with a university education were more likely to disagree, respectively. Interestingly, respondents with a university education were more likely to report not knowing and/or having no opinion with the notion that a vaccine providing immunization against several diseases is more likely to cause serious side effects, whereas respondents without a university education were more likely to agree with this belief. In addition, parents of older children (i.e., ≥ 17 years old) and non-parents were also more likely to report not know and/or having no opinion about the aforementioned belief, whereas parents of young children (i.e., ≤ 16 years old) were more likely to agree.

These findings highlight the complexity of the public's endorsement of vaccine beliefs, suggesting that rather than agreeing or disagreeing with certain 'common vaccine misconceptions', individuals may report not knowing and/or having no opinion about these issues. Reasons for individuals' reported uncertainty are potentially related to a lack of knowledge, misunderstanding of information, and/or a lack of interest in the subject matter. In fact, agreement with these 'common misconceptions' has commonly been attributed to a 'knowledge deficit' often associated with education, implying that inadequate information and/or misunderstanding of the mechanisms of vaccination leads to vaccine resistance (Ritvo et al., 2003; Dubé et al., 2013; Yaqub et al., 2014). In contrast, disagreement with 'negative' vaccine beliefs is typically associated with confidence in vaccination and vaccine science, resulting in greater vaccine acceptance (Larson et al., 2014). Importantly, a measles epidemic, characterized as the largest outbreak in North America in a decade, occurred in Quebec approximately one year prior to the survey (CBC, 2011; De Serres et al., 2013). Lower rates of MMR vaccine coverage were linked to the outbreak, and reports suggested that lower immunization rates were associated with increased parental resistance towards the MMR vaccine. Thus, use of the availability heuristic would suggest that Canadian respondents might have recalled media coverage of the 'ongoing debate' surrounding the purported link between the MMR vaccine and the development of childhood autism (Wakefield et al., 1998; Editors of the Lancet, 2010).

The differences observed according to respondents' gender and parental status might also reflect stronger commitment to health- and vaccine-related issues and greater concern about the risks associated with both vaccines and vaccine-preventable diseases among women and parents of young children compared to men and parents with children aged 17 or older as well as non-parents, respectively. Previous studies have highlighted the distinct

characteristics shaping parental decision-making with respect to vaccination (Petts & Neimeyer, 2004; Casiday, 2007). These findings are also consistent with previous reports suggesting that women demonstrate higher perceived risk of vaccine-preventable diseases and greater concern about vaccine safety compared to men (Freed et al., 2010; Gidengil, Parker, & Zikmund-Fisher, 2012). In contrast, findings from the Canadian national risk perception survey conducted in 2002 reported that women were less knowledgeable and more frequently undecided compared to men based on their responses to various vaccine-related statements (Ritvo et al., 2003).

Results of the present study also identified differences in patterned responses to negative belief statements about vaccine safety, and positive belief statements about the regulation and benefits of vaccines according to respondents' age and education. Findings indicate that younger adults and adults without a university education are more concerned about vaccine side effects and are more likely to believe that vaccines are not necessary compared to older adults and adults with a university education, respectively. Heightened questioning of the safety and necessity of vaccines among younger adults can be interpreted in relation to issues of complacency that are believed to contribute to increased vaccine hesitancy, particularly in developed countries where the success of immunization programs has paradoxically resulted in a lower perceived need for vaccination (WHO, 2014, MacDonald, 2015). The latter view is particularly apparent among younger generations of adults that have not witnessed the detrimental consequences of vaccine-preventable diseases, such as polio. The anchoring heuristic suggests that individuals make decisions based on known values or beliefs (i.e., anchors) that are shaped by past events, and subsequently guide their judgment of the probability of future events (Kahneman & Tversky, 1972; Smith et al., 2013). Use of the anchoring heuristic would suggest that individuals who remember

the detrimental consequences of vaccine-preventable diseases may be more likely to accept vaccination compared to individuals that have not witnessed such events.

. Results indicating that younger adults are less likely to follow government recommendations are in line with findings from another study that characterized subgroups of the population based on their reported attitudes and beliefs about several different vaccination programs (Velan et al., 2012). Findings from that study revealed that younger individuals tended to exhibit higher degrees of individualism compared to older individuals, suggesting that the vaccine attitudes exhibited by younger adults emphasized the importance of autonomous decision-making, which is less apparent among older adults (Velan et al., 2012).

In addition to lower concern about vaccine side effects and higher endorsement of the necessity of vaccines, individuals with a university education appear to be more confident about the role of science and technology in ensuring the safety of vaccines, compared to individuals without a university education; individuals with a university education are also more likely to consider that the benefits of vaccines outweighing the risks, and that they are unlikely to experience serious side effects from a vaccine. Research suggests that educational attainment plays an important role in vaccine hesitancy; however, findings are mixed and context-specific, suggesting that both higher and lower educational attainment may be associated with increased vaccine hesitancy across different populations (Larson et al., 2014; MacDonald, 2015; Dubé, Vivion, & MacDonald, 2015). Vaccine hesitancy has often been attributed to a lack of information or ‘knowledge deficit’ among those who reject vaccination (MacDonald, Smith, & Appleton, 2012; Marshall, 2013;Yaqub et al., 2014). Consistent with other findings (Prislin, 1998; Ritvo et al., 2003; Gust et al., 2003; 2005; Shui et al., 2006; Peretti-Watel et al., 2014; Larson et al., 2014), individuals with without a

university education demonstrated stronger agreement with negative beliefs statements about vaccine safety, compared to individuals with a university education. Similarly, a 2004 survey on health risk perception in Canada found that individuals with lower educational attainment perceived higher health risks associated with vaccines compared to individuals with higher educational attainment (Krewski et al., 2006). Also, a 2002 survey assessing Canadians' knowledge and attitudes about vaccines found a significant trend between increasing education and more positive vaccine attitudes (Ritvo et al., 2003). Although results from the present survey did not assess respondents' understanding of the biological mechanisms of vaccines and immunization (i.e., vaccine knowledge), the aforementioned findings suggest that differences in the endorsement of certain vaccine beliefs is associated with individuals' educational attainment.

Finally, differences in reported vaccine-related behaviours revealed that women, parents with younger children (i.e., ≤ 16 years old), individuals with greater concern about vaccine safety, and individuals that demonstrate stronger endorsement of the benefits of vaccines and vaccine regulation are more likely to discuss vaccine-related information with others. Reported agreement with this vaccine-related behaviour may relate to individuals' commitment to health- and vaccine-related issues (Peretti-Watel et al., 2015) and to the importance of social norms, which have been shown to play an important role in parental vaccine decision-making, although not in relation to gender and vaccine beliefs specifically (Streefland, Chowdhury, & Ramos-Jimenez, 1999; Brown et al., 2011; Sturm, Mays, & Zimet, 2005; Brunson, 2013; Opel & Marcuse, 2013; Leask, Willaby, & Kaufman, 2014). Notably, qualitative findings by Benin et al. (2006) revealed that complying with cultural norms was a factor that promoted vaccine acceptance among the mothers they interviewed.

Results also found that older individuals, individuals less concerned about vaccine safety, and individuals that demonstrate stronger endorsement of the benefits of vaccines and vaccine regulation are more likely to report receiving the seasonal influenza vaccine. Age differences in reported receipt of the seasonal influenza vaccine are consistent with results from the 2012 adult National Immunization Coverage survey (aNIC; PHAC, 2012), which found that increasing age was associated with greater likelihood of seasonal influenza immunization. Interestingly, results indicate that the endorsement of negative beliefs about vaccine safety is more strongly associated with discussing vaccine-related information than the endorsement of positive beliefs about the regulation and benefits of vaccines. In contrast, endorsement of positive beliefs about the regulation and benefits of vaccines is more strongly associated with reported receipt of the seasonal influenza vaccine than the endorsement of beliefs about vaccine safety.

Limitations

The present study is not without limitations. Firstly, potential responses biases due to the use of a Probit™ panel of respondents, low response rates, and the uneven distribution of levels of ‘disagreement’ vs. ‘agreement’ depicted in the 5-point Likert scale must be acknowledged as potential limitations of the present findings. Also, despite the stratified sampling procedure, survey respondents had a higher level of education and income than the general population. Secondly, with the exception of reported receipt of the seasonal influenza vaccine, most survey statements pertained to vaccines in general and did not distinguish between vaccines and vaccine-preventable diseases. The latter limits the interpretability of the present findings to the understanding of respondents’ attitudes towards vaccines *in general*, and does not provide insight on attitudes towards specific vaccines,

which have been reported in other studies (Ritvo et al., 2003; Velan et al., 2012). Potential implications of a selection bias resulting from the exclusion of the statements ‘The Measles-Mumps-Rubella vaccine can cause autism’ and ‘A vaccine that protects against several diseases is more likely to cause serious side effects’ from the principal components analysis are also important to consider when interpreting results of subsequent multivariate analyses.

Conclusion

The results of this study provide important insight into the observed heterogeneity of vaccine hesitancy among Canadian adults, as demonstrated by differences in the endorsement of various vaccine-related beliefs according to individuals’ socio-demographic characteristics. Notably, the endorsement of several vaccine beliefs appears to differ between younger and older adults and between adults with and without a university education. Findings also indicate that negative beliefs about vaccine safety and positive beliefs about the regulation and benefits of vaccines are significant predictors of reported vaccine behaviours, including discussing vaccine-related information with others and receipt of the seasonal influenza vaccine. Notably, vaccine belief statements were not specific to influenza immunization, indicating that beliefs about vaccines and immunization *in general*, as opposed to vaccine-specific beliefs, appear to be associated with reported behaviours that are vaccine-specific (i.e., reported receipt of the seasonal influenza vaccine).

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Appendix A

Socio-demographic characteristics of respondents who completed the vaccine-related subsection of the national health risk perception survey (N = 1,125).

Characteristic	N	%	
Gender	Male	560	49.8
	Female	565	50.2
Age (years)	18-24	59	5.3
	25-34	200	17.8
	35-44	189	16.8
	45-54	194	17.3
	55-64	248	22.1
	65+	233	20.7
Education	High school or <	198	17.7
	Community college	264	23.6
	University	418	37.3
	Graduate school	240	21.4
Income	< \$50,000	269	27.4
	\$50,000 to < \$60,000	106	10.8
	\$60,000 to < \$80,000	174	17.8
	\$80,000 to < 100,000	147	15.0
	\$100,000 to < \$150,000	187	19.1
	\$150,000 to < \$200,000	56	5.7
	\$200,000 +	41	4.2
General Health	Excellent	140	12.5
	Very good	440	39.2
	Good	340	30.3
	Fair	157	14.0
	Poor	44	3.9
Parental status	Yes	267	23.7
	No	858	76.3
Language	English	909	80.8
	French	216	19.2
Area of Residence	Urban	841	75.0
	Rural	281	25.0
Region	British Columbia	160	14.2
	Prairies	178	15.8
	Ontario	462	41.1
	Quebec	246	21.9
	Eastern	79	7.0

Note: Prairies = Alberta, Saskatchewan, Manitoba; Eastern = New Brunswick, Nova Scotia, Prince-Edward-Island, Newfoundland.

Parental status: Yes = parent with at least one child age 16 or younger, No = others

Appendix B

Component loadings of a principal components analysis with 16 vaccine-related belief statements (N = 900)

Statements	Mean (SD)	C1	C2
Vaccines weaken the immune system.	1.92 (1.17)	0.74	-0.06
I am concerned about the safety of vaccines.	2.43 (1.37)	0.73	-0.14
When the people I like worry about vaccines I am more likely to worry as well.	2.17 (1.25)	0.66	0.15
Information about vaccines is confusing.	2.51 (1.19)	0.65	-0.10
Vaccines are not necessary because diseases cure themselves naturally.	1.53 (0.91)	0.64	0.05
It is difficult to predict the long-term effects of vaccines.	3.04 (1.28)	0.64	-0.06
Vaccines can cause many harmful side effects, illnesses, and even death.	2.55 (1.26)	0.63	-0.14
Getting sick from a disease is more acceptable to me than getting sick from a vaccine.	2.37 (1.42)	0.61	0.10
Science and technology help to ensure that vaccines are safe.	3.83 (1.03)	-0.22	0.68
Even if I didn't understand why, I would likely follow the advice from government authorities to get the recommended vaccine.	2.88 (1.30)	-0.09	0.66
Scientists usually agree about the risks associated with vaccines.	2.89 (1.20)	0.04	0.65
Organizations such as workplaces and schools should facilitate vaccination campaigns.	3.79 (1.18)	-0.16	0.64
It is the government's responsibility to ensure the availability of vaccines for Canadians.	4.28 (0.93)	0.02	0.56
Vaccines provide complete and long-term immunization against diseases.	2.82 (1.24)	0.06	0.55
Diseases that can be prevented by vaccines have been virtually eliminated in Canada.	3.10 (1.28)	0.17	0.49
It is unlikely that I will experience serious side effects from a vaccine.	3.30 (1.33)	-0.21	0.47
Percent variance	---	29.04	13.30

NOTE: C1 = Concern about vaccine safety; C2 = Vaccine regulation and benefits

Appendix C

Socio-demographic characteristics of respondents who completed the vaccine-related subsection of the national health risk perception survey (N = 900).

Characteristic		N	%
Gender	Male	467	51.9
	Female	433	48.1
Age (years)	18-24	46	5.1
	25-34	157	17.5
	35-44	153	17.0
	45-54	160	17.8
	55-64	206	22.9
	65+	177	19.7
Education	High school or <	145	16.2
	Community college	214	23.9
	University	341	38.1
	Graduate school	196	21.9
Income	< \$50,000	203	25.5
	\$50,000 to < \$60,000	86	10.8
	\$60,000 to < \$80,000	537	19.2
	\$80,000 to < 100,000	108	13.6
	\$100,000 to <	162	20.4
	\$150,000		
	\$150,000 to <	46	5.8
	\$200,000		
	\$200,000 +	38	4.8
General Health	Excellent	118	13.1
	Very good	351	39.0
	Good	272	30.3
	Fair	225	13.9
	Poor	32	3.6
Parent	Yes	593	66.0
	No	305	34.0
Language	English	739	82.1
	French	161	17.9
Area of Residence	Urban	674	75.1
	Rural	224	24.9
Region	British Columbia	123	13.7
	Prairies	144	16.0
	Ontario	387	43.0
	Quebec	183	20.3
	Eastern	63	7.0

Note: Prairies = Alberta, Saskatchewan, Manitoba; Eastern = New Brunswick, Nova Scotia, Prince-Edward-Island, Newfoundland.

**Chapter 3: Factors Associated with Reported Receipt of the Seasonal Influenza
Vaccine: Investigating Interrelationships Between Components of Vaccine Beliefs and
Socio-Demographic Characteristics**

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Abstract

Vaccine hesitancy is a complex phenomenon expressed to varying degrees within a heterogeneous group of individuals with hesitant beliefs, attitudes, and behaviours towards vaccination. The present study sought to identify differences in reported receipt of the seasonal influenza vaccine across subgroups of Canadian adults, and to determine whether the relationships between components of vaccine beliefs and reported receipt of the seasonal influenza vaccine varied according to socio-demographic characteristics. An in-depth survey questionnaire was administered to a national sample of Canadian adults in which respondents were asked to rate their level of agreement with statements related to vaccines and immunization. Two components reflecting negative beliefs about vaccine safety and positive beliefs about the regulation and benefits of vaccines were identified in a previous study. These components were included, along with socio-demographic variables, as predictors of reported receipt of the seasonal influenza vaccine in a series of multivariate analyses. Respondents' age, beliefs about vaccine safety, and beliefs about the regulation and benefits of vaccines were significant predictors of reported receipt of the seasonal influenza vaccine. Furthermore, both components of vaccine beliefs were found to mediate the relationship between age and reported receipt of the seasonal influenza vaccine. Finally, educational attainment significantly moderated the relationship between beliefs about vaccine safety and reported receipt of the seasonal influenza vaccine, suggesting that among individuals expressing greater concern with vaccine safety, those with higher educational attainment are more likely to refuse seasonal influenza vaccination compared to those with lower educational attainment. These results provide valuable insight into the complexity of vaccine hesitancy in Canada, indicating that a multifactorial approach is necessary to better understand the driving forces underlying this phenomenon. Specifically, the present findings

suggest that interrelationships between components of vaccine beliefs and socio-demographic characteristics are significant predictors of reported vaccination behaviour.

Key Words: Vaccine hesitancy, vaccine beliefs, seasonal influenza, age, education.

Introduction

As the number one contributor to decreased morbidity and mortality around the world, vaccines are considered one of the greatest public health achievements to date (CDC, 1999). Despite this success, public questioning of the necessity, effectiveness, and safety of vaccines has become increasingly apparent in many industrialized countries (Ritvo et al., 2003; Benin et al., 2006; Freed et al., 2010; Larson et al., 2011; LaVail & Kennedy, 2012; Marshall, 2013; WHO, 2014). The term ‘vaccine hesitancy’ is increasingly used to describe hesitant attitudes and beliefs about vaccines and immunization among a heterogeneous group of individuals with varying degrees of concern about vaccines (Larson, 2013; Dubé et al., 2013; Gowda & Dempsey, 2013; WHO, 2014). Vaccine hesitancy results from a complex decision-making process and is influenced by a multitude of factors (WHO, 2014). The heterogeneous nature of this phenomenon, which encompasses both attitudinal and behavioural outcomes, has made it difficult to address. Further investigations are therefore required to better understand the factors underlying vaccine hesitance and the interrelationships among them.

Public confidence in vaccination and concern with the safety and effectiveness of vaccines have been identified as predominant factors associated with vaccine hesitancy (Ball, Evans, & Bostrom, 1998; Chen, 1999; Streefland, 2001; Ritvo et al., 2003; Mills et al., 2005; Benin et al., 2006; Cooper, Larson, & Katz, 2008; Freed et al., 2010; Black & Rappuoli, 2010; Larson et al., 2011; LaVail & Kennedy, 2012; Opel et al., 2011a; Yaqub et al., 2014; WHO, 2014; Larson et al., 2015). A recent report by the Strategic Advisory Group of Experts (SAGE) Working Group on Vaccine Hesitancy established issues associated with confidence (trust in the vaccine or the vaccine provider), complacency (the perceived value and necessity of the vaccine), and convenience (access to vaccination) as predominant

factors, among others, of vaccine hesitancy (WHO, 2014). In addition, contextual influences (e.g., sociocultural, environmental), individual and group influences (e.g., personal perceptions, knowledge, attitudes, and beliefs), and vaccine-specific issues (e.g., vaccine novelty, program/campaign) have been identified as important determinants of vaccine hesitancy and subsequent vaccine receipt (Gowday & Dempsey, 2013; WHO, 2014).

Increased hesitancy towards vaccination is believed to contribute to lower immunization rates among children and adults, and health authorities fear that the latter could negatively impact the success of current and future vaccination programs (Tickner et al., 2006; Falagas & Zarkadoulia, 2008; Brown et al., 2011; Siddiqui, Salmon, & Omer, 2013; Dubé et al., 2013; WHO, 2014). Although many studies have focused on parental compliance with childhood vaccinations, a growing body of literature has sought to explain vaccine hesitancy beyond parental compliance with childhood vaccinations (Ritvo et al., 2003; Omer et al., 2009; Larson et al., 2011; Velan et al., 2012; Dubé et al., 2013; Larson et al., 2014; Yaqub et al., 2014; Perreti-Watel et al., 2015). Notably, immunization for seasonal influenza remains one of the more controversial vaccines currently endorsed by public health officials. According to results from the Public Health Agency of Canada's (PHAC) adult National Immunization Coverage (aNIC) survey, immunization rates for seasonal influenza are suboptimal among the Canadian general population (PHAC, 2012). Findings identified age, occupation (i.e., health care worker), having a high-risk medical condition, and recommendations from healthcare professionals as factors shown to increase the probability of receiving the seasonal influenza vaccine (PHAC, 2012). In contrast, educational attainment and household income were not directly associated with rates of seasonal influenza vaccination among the general public (PHAC, 2012). Predominant reasons associated with public refusal of the seasonal influenza vaccine include low perceived risk

associated with contracting the influenza virus, doubts about the effectiveness of the vaccine, and concerns with experiencing minor (i.e., influenza-like symptoms, fatigue, soreness) to more serious (developing Guillaume Barré Syndrome) adverse events following vaccination (Chapman & Coups, 1999; Weinstein et al., 2007; Hollmeyer et al., 2009; Osterholm et al., 2012; Kwong et al., 2013).

Importantly, the refusal or delay of vaccination is not the sole predictor of vaccine hesitancy, since hesitant individuals may still accept vaccination despite having major doubts or concerns about doing so (Dubé et al., 2013; WHO, 2014, Peretti-Watel et al., 2015). Previous studies have therefore sought to identify ‘profiles’ of vaccine hesitancy across subgroups of the population based on attitudes, beliefs, and socio-demographic characteristics (Prislin et al., 1998; Opel et al., 2011a; 2011b; Velan et al., 2012; LaVail & Kennedy, 2012; Gowda et al., 2013). Still, the extent to which these factors influence vaccine decision-making and behaviour remains unclear. As such, a better understanding of the relationships among the factors associated with vaccine hesitancy and various determinants, including contextual and individual influences, could provide important insight for targeted intervention strategies that would promote vaccine acceptance and subsequent vaccine receipt among hesitant subgroups of the population.

In light of this, the main objective of the present study is to investigate interrelationships among components of vaccine beliefs, socio-demographic characteristics, and reported receipt of the seasonal influenza vaccine.

Methods

A detailed description of the survey instrument (survey content), sampling procedures (survey recruitment), and sample of respondents (survey sample) used in this

study can be found in Perna et al. (2016). This section contains only methodological information essential to the current investigation.

Participants

A random subsample of 1,125 Canadian adults (≥ 18 years old) was obtained from a larger stratified sample of survey respondents that closely approximated the Canadian general population with respect to age, gender and region (according to the 2011 Canadian Census). The subsample represents all respondents that completed the vaccine-related subsection of the survey¹. A detailed breakdown of respondents' socio-demographic characteristics can be found in Perna et al. (2016).

Measures of Vaccine Beliefs and Behaviour

Survey respondents indicated their level of agreement with 21 vaccine-related belief statements about vaccine science, risk acceptability, uncertainty, perceived risk, and internal (i.e., individual responsibility) and external (i.e., the role of regulators) control. Belief statements included 5 'common vaccine misconceptions' identified by the Centre for Disease Control and Prevention (CDC), the World Health Organization (WHO), and Health Canada (CDC, 1999; 2007; Health Canada, 2011; WHO, 2015). Respondents also indicated their level of agreement with the statement "I usually get the seasonal flu vaccine", the behavioural outcome variable designed to assess reported receipt of the seasonal influenza vaccine. Respondents' level of agreement was measured using a Likert scale ranging from 1 to 5 (1 = do not agree at all, 2 = agree a little bit, 3 = agree somewhat, 4 = agree quite a bit, 5 = agree completely). Respondents could also indicate if they did not know or had no opinion (99 = don't know/no opinion).

¹ Approximately one third of respondents from the total sample randomly selected to complete one of three subsections of the survey on vaccines, radiation, or emergency preparedness.

Statistical Analyses

A principal components analysis (PCA) reduced 16 vaccine-related belief statements to 2 components reflecting negative beliefs about vaccine safety and positive beliefs about the regulation and benefits of vaccines (see Perna et al., 2016 for a detailed description of the PCA). Component scores were computed using a ‘standardized weighted sum of scores’ method, whereby each item was standardized, multiplied by its respective loading value, and summed with other items (i.e., items loading onto the same component) (Tabachnick & Fidell, 2007; DiStefano et al., 2009).

Relationships among components of vaccine beliefs, socio-demographic variables, and reported receipt of the seasonal influenza vaccine were initially assessed using a correlation matrix, which identified significant Pearson’s correlations among the variables of interest.

A Univariate Analysis of Variance (ANOVA) and Univariate Analyses of Covariance (ANCOVA) were conducted to provide a descriptive account of differences in agreement (i.e., mean score (M) based on a 5-point Likert scale ranging from 1 (‘do not agree at all’) to 5 (‘agree completely’)) with the statement ‘I usually get the seasonal flu vaccine’ (i.e., reported receipt of the seasonal influenza vaccine) according to socio-demographic characteristics of interest.

A hierarchical linear regression was subsequently performed to determine whether components of vaccine beliefs, while controlling for socio-demographic variables of interest, were significant predictors of reported receipt of the seasonal influenza vaccine (i.e., level of agreement with the statement: ‘I usually get the seasonal flu vaccine’).

Following the identification of significant predictors of reported receipt of the seasonal influenza vaccine, further investigation of the relationship between the predictors

and the outcome variable (i.e., reported receipt of the seasonal influenza vaccine) was conducted using moderation and mediation analyses. Moderation analyses were conducted to determine using hierarchical linear regressions with standardized scores, and significant interactions were plotted using a web utility for simple slopes (Dawson, 2014). A multiple mediation analysis was conducted using the INDIRECT macro for assessing indirect effects in multiple mediator models, with mediators operating in parallel (Preacher & Hayes, 2008). A bootstrap procedure with confidence intervals based on 5,000 bootstrap samples was also performed to determine unique effects of each mediator (Preacher, Rucker, & Hayes, 2007).

All statistical analyses were performed using SPSS version 22.

Results

Components of Vaccine Beliefs

Components extracted from a PCA with 16 vaccine-related belief statements were interpreted as ‘concern about vaccine safety’ (C1) and beliefs about ‘vaccine regulation and benefits’ (C2) (see Perna et al., 2016 for a detailed description of components). The first component accounted for 29.04% of the total variance and included 8 statements mostly related to vaccine side effects. Agreement with these statements reflected negative attitudes about vaccination. The second component accounted for 13.30% of the total variance and included statements related to vaccine regulation (5 statements) and the benefits of vaccines (3 statements). Agreement with these statements reflected positive attitudes about vaccination. Cronbach’s alpha for the first and second component was of 0.83 and 0.75, respectively, indicating good internal consistency among the items within each component. The PCA was performed with a subsample of 900 respondents due to a listwise deletion of

missing values (i.e., ‘do not know/no opinion’ responses) (see Perna et al., 2016 for socio-demographic breakdown of the subsample).

Correlation Matrix

A correlation matrix (see Table 1) revealed that age was highly correlated with reported receipt of the seasonal influenza vaccine. In addition, respondents’ area of residence (urban vs. rural) and parental status (parents with at least one child aged 16 or younger vs. others) were also significantly correlated with reported receipt of the seasonal influenza vaccine. Finally, the component reflecting beliefs about vaccine safety (C1) was significantly correlated with respondents’ education and area of residence.

Table 1. Correlation matrix with the behavioural outcome variable, socio-demographic variables, and components of vaccine hesitancy.

Variables	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. I usually get the seasonal flu vaccine	---									
2. Gender	0.01	---								
3. Age	0.34**	0.01	---							
4. Education	0.02	-0.05	-0.09**	---						
5. Income	-0.02	-0.13**	-0.14**	0.35**	---					
6. General Health	0.01	0.04	0.00	-0.05	-0.10**	---				
7. Parental Status	-0.15**	-0.06*	0.34**	-0.04	-0.21**	0.00	---			
8. Area of Residence	-0.07*	0.06	-0.00	-0.15**	-0.04	-0.02	-0.07*	---		
9. Concern about Vaccine Safety	-0.37**	0.02	-0.13**	-0.29**	-0.23**	0.06	-0.03	0.17**	---	
10. Vaccine Benefits and Regulation	0.42**	0.01	0.08**	0.04	0.05	-0.04	0.05	-0.02	-0.36**	---

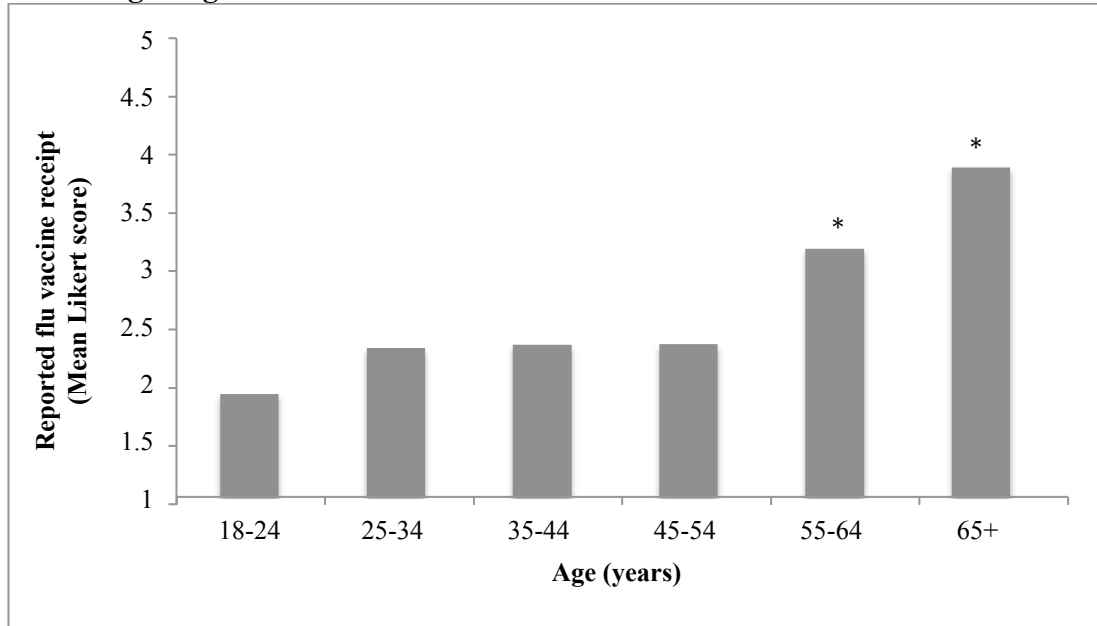
NOTE: Gender: Male = 1, Female = 2; Parent: Yes = 1, No = 2, Language: English = 1, French = 2; Born in Canada: Yes = 1, No = 2; Area of Residence: Urban = 1, Rural = 2.

* $p < .05$, ** $p < .01$

Analysis of Variance

A one-way analysis of variance (ANOVA) revealed that the level of agreement with the statement 'I usually get the seasonal flu vaccine' differed significantly based on respondents' age, $F(5, 1111) = 35.19, p < 0.001$. A *post-hoc* Tukey test further revealed that responses did not differ among respondents aged 18-24 (M = 1.90), 25-34 (M = 2.30), 35-44 (M = 2.33), and 45-54 (M = 2.33); however the level of agreement reported by respondents aged 55-64 (M = 3.16) and those aged 65+ (M = 3.90) differed from each other, and from the aforementioned age categories (see Figure 1).

Figure 1. Mean differences in reported receipt of the seasonal influenza vaccine according to age

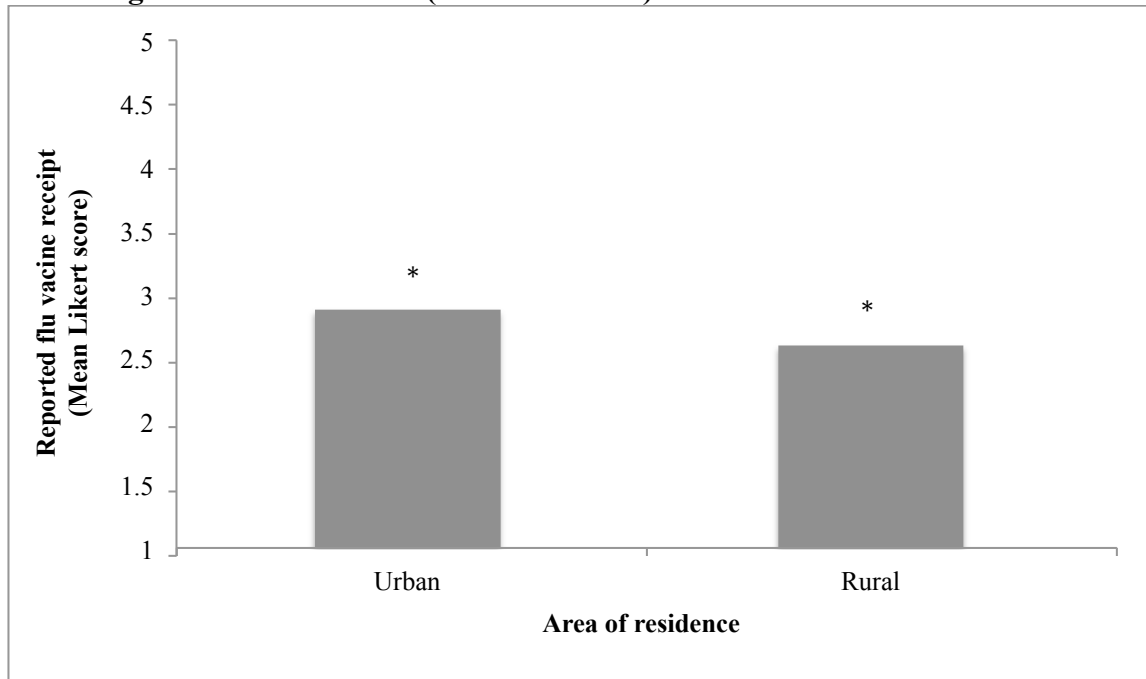


* = significant differences

Analyses of Covariance

Analysis of covariance was used to investigate differences in reported agreement with the statement ‘I usually get the seasonal flu vaccine’ according to respondents’ area of residence (i.e., urban vs. rural), parental status (i.e., individuals with at least one child ≤ 16 years old vs. non-parents and parents with at least one child ≥ 17 years old), and region of residence (i.e., British-Columbia vs. the Prairies vs. Ontario vs. Quebec vs. Eastern provinces), while controlling for the effect of age. Results revealed that reported receipt of the seasonal influenza vaccine did not differ according to parental status and region of residence; however, a significant difference according to area of residence was observed, $F(1, 1111) = 5.80, p < 0.05$ (see Figure 2). Results of the ANCOVA revealed that after controlling for the effect of age, respondents residing in urban areas ($M = 2.88$) reported significantly stronger agreement with the statement ‘I usually get the seasonal flu vaccine’ compared to respondents residing in rural areas ($M = 2.60$).

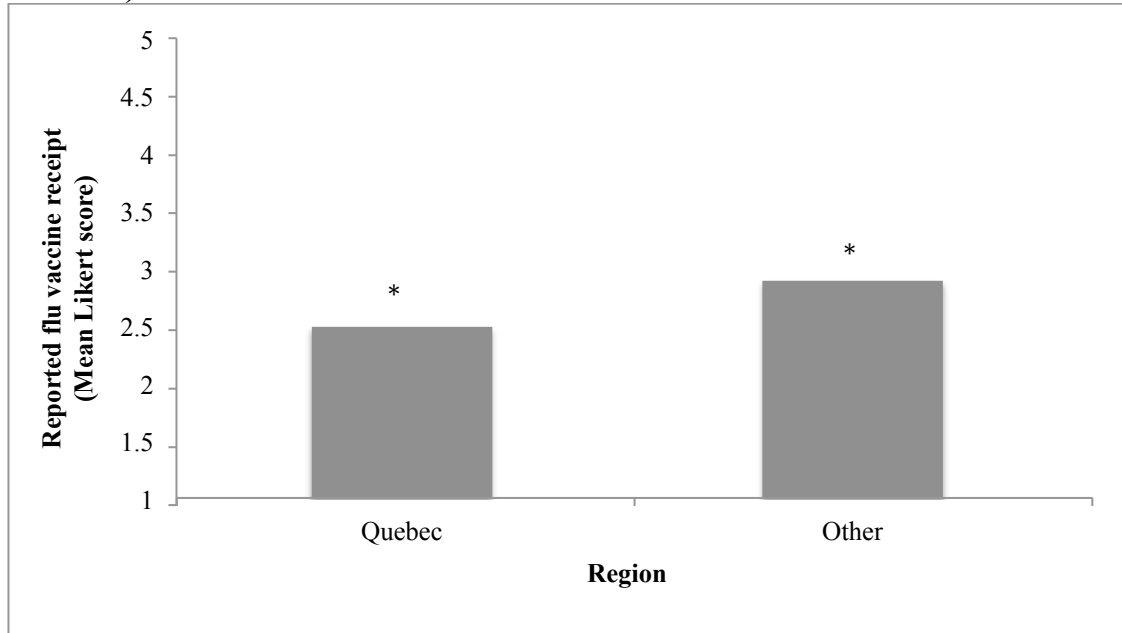
Figure 2. Mean differences in reported receipt of the seasonal influenza vaccine according to area of residence (urban vs. rural)



* = significant differences

Despite non-significant differences in reported receipt of the seasonal influenza vaccine across regions in Canada, it was of interest to investigate whether reported influenza immunization differed between respondents residing in the province of Quebec compared to respondents from elsewhere in Canada (British Columbia, the Prairies, Ontario, and the Eastern provinces combined). Interest in this comparison was motivated by of previous reports indicating that Quebec was the province with the lowest proportion of its population immunized for seasonal influenza (Canadian Lung Association, 2011; Statistics Canada, 2015). Results from an ANCOVA revealed that while controlling for the effect of age, respondents' residing in Quebec ($M = 2.49$) reported lower levels of agreement with the statement 'I usually get the seasonal flu vaccine' compared to respondents residing in other regions in Canada ($M = 2.89$), $F(1, 1114) = 4.02, p < 0.05$ (see Figure 3).

Figure 3. Mean differences in reported flu vaccine receipt according to region (Quebec vs. other)



Note: Other = respondents residing in British-Columbia, the Prairies, Ontario, and Eastern provinces combined.

* = significant differences

Hierarchical Linear Regressions

In light of a number of significant correlations depicted in Table 1, a hierarchical linear regression was conducted to determine whether components of vaccine beliefs (i.e., ‘concern about vaccine safety’, beliefs about ‘vaccine regulation and benefits’) were significant predictors of reported receipt of the seasonal influenza vaccine (i.e., agreement with the statement ‘I usually get the seasonal flu vaccine’). Controlling for socio-demographic variables in the first step, the final model significantly predicted reported receipt of the seasonal influenza vaccine, $R^2 = 0.31$, $F(5, 888) = 78.30$, $p < 0.001$. Predictors accounted for 30% of adjusted variance in reported receipt of the seasonal influenza vaccine. The change in R after Step 1 was 0.19, $\Delta F(2, 888) = 121.13$, $p < 0.001$, indicating that the addition of both components of vaccine beliefs into the model added significantly to the prediction of reported receipt of the seasonal influenza vaccine. The un-standardised regression coefficients (B) and standardized regression coefficients (β) are presented in Table 2.

Table 2. Results of a hierarchical linear regression identifying predictors of reported receipt of the seasonal influenza vaccine (N = 894)

Variable	<i>B (SE)</i>	β
<i>Step 1</i>		
Age	0.36 (0.04)	0.31***
Parental status	0.17 (0.14)	0.04
Area of residence	-0.34 (0.13)	-0.08**
<i>Step 2</i>		
Age	0.31 (0.04)	0.27***
Parent status	0.12 (0.12)	0.03
Area of residence	-0.16 (0.12)	-0.04
Concern about Vaccine Safety	-0.10 (0.02)	-0.21***
Vaccine Regulation and Benefits	0.20 (0.02)	-0.32***

$R^2 = 0.12$ for Step 1 ($p < 0.001$), $\Delta R^2 = 0.19$ for Step 2 ($p < 0.001$)

** $p < 0.01$, *** $p < 0.001$

Results from the correlation matrix presented in Table 1 also indicated that the component reflecting beliefs about vaccine safety was negatively correlated with respondents' level of education, $r = -0.29$, $p < 0.01$, indicating that respondents with higher educational attainment reported lower levels of agreement with belief statements about vaccine safety. A significant correlation between beliefs about vaccine safety and respondents' area of residence was also identified, $r = 0.17$, $p < 0.01$, indicating that respondents residing in urban areas reported lower levels of agreement with belief statements about vaccine safety. In light of this, it was of interest to investigate the separate moderating effects of education and area of residence on the relationship between beliefs about vaccine safety and reported receipt of the seasonal influenza vaccine, while controlling for the effect of age.

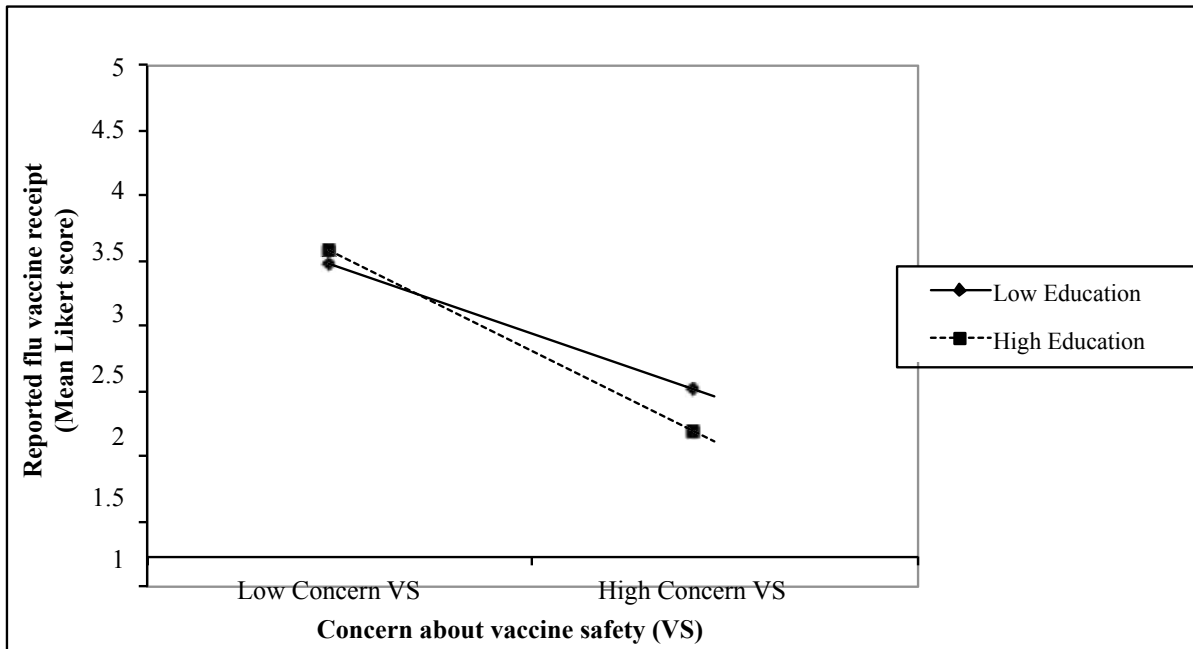
A first hierarchical linear regression was conducted with age entered into the model in the first step, standardized variables of education and concern about vaccine safety entered on the second step, and the interaction term 'education \times concern about vaccine safety' entered on the third step. Controlling for the unique effects of age, education, and concern about vaccine safety, the moderating role of education on the relationship between concern with vaccine safety and reported receipt of the seasonal influenza vaccine was significant, $\Delta R^2 = 0.01$, $\Delta F(1, 944) = 4.04$, $p < 0.05$. The un-standardised regression coefficients (B) and standardized regression coefficients (β) are presented in Table 3.

Table 3. Results of a hierarchal regression investigating the moderating effect of education on the relationship between concern with vaccine safety and reported receipt of the seasonal influenza vaccine (N = 949).

Variable	<i>B (SE)</i>	β
<i>Step 1</i>		
Age	0.59 (0.06)	0.33***
<i>Step 2</i>		
Age	0.51 (0.05)	0.29***
Education	-0.06 (0.05)	-0.04
Concern about Vaccine Safety	-0.61 (0.05)	-0.34***
<i>Step 3</i>		
Age	0.51 (0.05)	0.28***
Education	-0.06 (0.05)	-0.03
Concern about Vaccine Safety	-0.62 (0.06)	-0.35***
Education \times Concern about Vaccine Safety	-0.11 (0.05)	-0.06*

$R^2 = 0.11$ for Step 1 ($p < 0.001$), $\Delta R^2 = 0.11$ for Step 2 ($p < 0.001$), $\Delta R^2 = 0.01$ for Step 3 ($p < 0.05$)
 * $p < 0.05$, *** $p < 0.001$.

Simple slope analyses indicated that levels of agreement with the statement ‘I usually get the seasonal flu vaccine’ differed according to the level of educational attainment for respondents exhibiting stronger levels of agreement with negative belief statements about vaccine safety (see Figure 3). Specifically, the moderation analysis indicated that among respondents indicating greater concern with vaccine safety, those with higher educational attainment reported lower levels of agreement with the statement ‘I usually get the seasonal flu vaccine’, compared to respondents with lower educational attainment.



NOTE: VS = Vaccine Safety

Figure 3. The relationship between concern with vaccine safety and reported receipt of the seasonal influenza vaccine moderated by education.

A second hierarchical regression was conducted to determine whether respondents' area of residence had a moderating effect on the relationship between beliefs about vaccine safety and reported receipt of the seasonal influenza vaccine. This hierarchical regression analysis revealed that the interaction between area of residence and concern about vaccine safety was not significant, indicating no moderating effect of respondents' area of residence on the relationship between concern about vaccine safety and reported receipt of the seasonal influenza vaccine.

Multiple Mediation Analysis

Based on the significant relationships reported in the correlation matrix, a multiple mediation analysis was conducted to determine whether both components significantly mediated the relationship between age and reported receipt of the seasonal influenza vaccine. A significant mediation effect was observed: the relationship between age and vaccine receipt strengthened when components reflecting 'concern about vaccine safety' and beliefs about 'vaccine regulation and benefits' were included in the model (i.e., the un-standardized beta coefficient (B) decreased when controlling for the mediators; see Figure 4). Bootstrapping techniques with 5,000 resamples produced 95% bias corrected confidence intervals (CIs) for the total effect of both mediators (CI = 0.02 to 0.09), the effect of concern with vaccine safety (CI = 0.01 to 0.05) and of beliefs about vaccine regulation and benefits (CI = 0.01 to 0.05) that did not include zero, indicating a significant effect of both mediators. This result indicates that higher reported receipt of the seasonal influenza vaccine among older respondents is in part related to lower agreement with negative beliefs about vaccine safety and stronger agreement with positive belief statements about the regulation and benefits of vaccines, whereas the opposite is true for younger respondents.

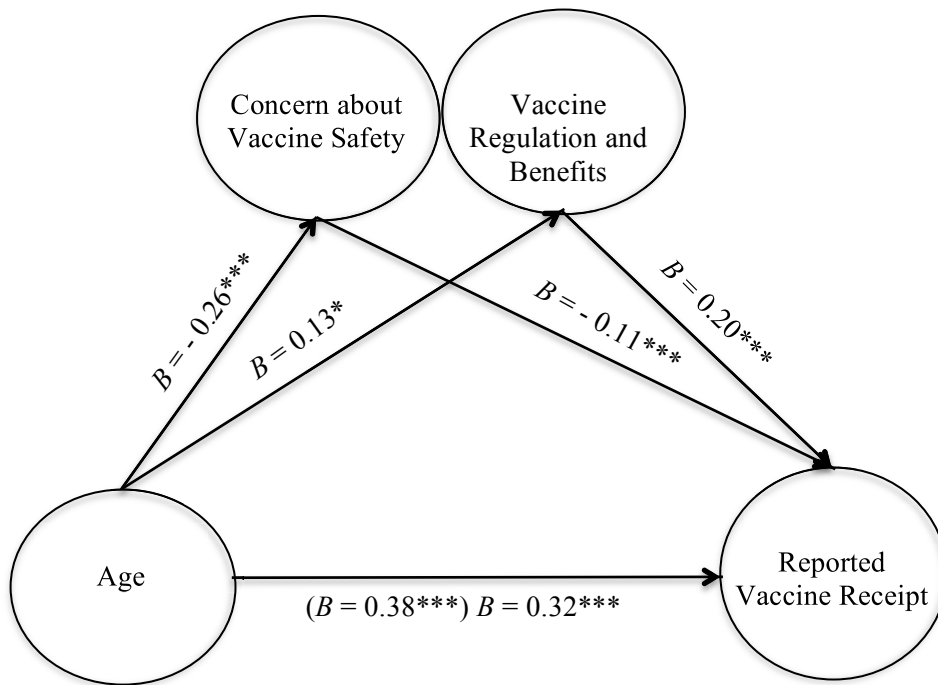


Figure 4. A multiple mediation analysis examining the effect of age on vaccine receipt, with concern about vaccine safety and beliefs about vaccine regulation and benefits as mediators. A significant mediation is present as demonstrated by a smaller coefficient for the direct effect of age on vaccine receipt, when controlling for both mediators.

(* $p < 0.05$, *** $p < 0.001$).

Discussion

The aim of the present study was to provide insight on reported receipt of the seasonal influenza vaccine among Canadian adults and to determine whether relationships between components of vaccine beliefs and individuals' socio-demographic characteristics predict reported influenza immunization.

Significant differences in reported receipt of the seasonal influenza vaccine were identified according to respondents' age, confirming results from the adult National Immunization Coverage (aNIC) survey (PHAC, 2012) indicating that increased age results in a higher likelihood of receiving the seasonal influenza vaccine. This finding is not surprising since older adults (age 65+) are considered to be at greater risk of contracting the seasonal influenza virus and of experiencing influenza-related complications (Health Canada, 2015). As a result, these individuals are more likely to receive, and be receptive to, healthcare provider recommendations to be vaccinated against the influenza virus on an annual basis. In addition, previous findings have demonstrated that actual and perceived membership in a priority group was significantly associated with influenza vaccine uptake (Kumar et al., 2012).

Subsequent analyses also revealed that, while controlling for the effect of age, reported receipt of seasonal influenza vaccine differed significantly according to respondents' area of residence (urban vs. rural), indicating higher reported influenza immunization among individuals residing in urban areas compared to rural areas in Canada. A possible interpretation of this finding might relate to an issue of access to vaccination that is more prominent in rural areas than in urban areas in Canada. Findings from the 2003 Canadian Community Health Survey revealed that individuals living in the most rural communities had lower odds of receiving a flu shot (Sibley & Weiner, 2011). Convenience

issues regarding the availability, affordability, and accessibility of vaccines have been identified as important factors associated with vaccine acceptance and subsequent uptake (Boerner et al., 2013; WHO, 2014).

In Canada, vaccination programs vary according to provincial jurisdictions (PHAC, 2015). In 2000, Ontario was the first Canadian province to adopt a universal vaccination program for coverage of the seasonal influenza vaccine for people aged 6 months and older (Schabas, 2001; Erickson et al., 2005). Since then, other provinces have implemented similar publicly funded programs to promote annual vaccination for seasonal influenza, with the exception of British Columbia, Quebec, and New Brunswick (PHAC, 2015). Provincial jurisdictions are suggested to impact rates of vaccine coverage and immunization rates for seasonal influenza have been shown to vary across provinces (Statistics Canada, 2015). Although reported influenza immunization did not differ across five Canadian regions, differences were observed between respondents residing in Quebec compared to those residing elsewhere in Canada. Findings indicated that respondents residing in Quebec are reportedly less likely to receive the seasonal influenza vaccine compared to respondents residing in other regions in Canada. These findings are consistent with other national reports issued by Statistics Canada (2015) and the Canadian Lung Association (2011) confirming that Quebec is the province with the lowest proportion of its population immunized for seasonal influenza. It is therefore important to consider the geo-political and economic contexts guiding vaccination programs as part of the broader contextual influences that impact population rates of vaccine uptake.

While differences in influenza immunization among Canadian adults have previously been shown to vary according to socio-demographic characteristics (Sibley & Weiner, 2011; PHAC, 2012), investigations of the interrelationships among factors associated with vaccine

hesitancy (e.g., attitudes and beliefs), individual and group determinants (e.g., socio-demographic characteristics), and reported vaccine receipt are limited. Findings from the present study identified components of beliefs about vaccine safety and about vaccine regulation and benefits (Perna et al., 2016) as significant predictors of reported receipt of the seasonal influenza vaccine, while controlling for socio-demographic characteristics of interest. Importantly, age remained a significant predictor of reported receipt of the seasonal influenza, and components of beliefs about vaccine safety and about vaccine regulation and benefits significantly mediated the relationship between age and reported receipt of the seasonal influenza vaccine. This finding suggests that higher reported receipt of the seasonal influenza vaccine among older individuals is associated with lower concern about vaccine safety (i.e., lower levels of agreement with negative beliefs about vaccine safety) and higher agreement with positive beliefs about the regulation and benefits of vaccines, not specifically related to the seasonal influenza vaccine. In turn, lower reported receipt of the seasonal influenza vaccine among younger adults was partially explained by higher agreement with negative beliefs about vaccine safety (i.e., greater concern about vaccine safety) and higher agreement with positive beliefs about the regulation and benefits of vaccines.

Increased scepticism about vaccination among younger individuals is likely associated with socio-cultural factors, including advances in public health and information sharing, which have resulted in a lower perceived risk of vaccine-preventable diseases and heightened concern with potential adverse effects of vaccines (Gray, 1999; Kata, 2012). Importantly, the implementation of mass vaccination programs has resulted in decreased morbidity and mortality associated with vaccine-preventable diseases (CDC, 1999). Thus, while older generations are likely to have witnessed the detrimental health effects of infectious diseases such as polio, younger generations have become increasingly complacent

due to lower perceived risk of vaccine-preventable diseases that are no longer common (MacDonald, 2015). In addition, advances in information sharing have resulted in widespread use of the Internet and social media to acquire a vast array of opinions on health- and vaccine-related issues from sources other than family physicians; these information sources are likely utilized to a greater extent by younger generations (Kata, 2012). Anti-vaccination advocates have effectively used these novel information-sharing platforms to easily and rapidly communicate their viewpoints to a broad audience (Wilson & Keelan, 2013; Wilson, Atkinson, & Deeks, 2014). The widespread availability and accessibility to information in conjunction with a structural environment that promotes continuous awareness of daily risks, also known as a 'risk culture' (Giddens, 1991), is encouraging individuals to make autonomous decisions about their health and to endorse a lifestyle guided by 'healthism' (Greenhalgh & Wessely, 2004; Peretti-Watel et al., 2015).

Healthism is described as a cultural feature of contemporary society that encourages individuals to exert control over their health by actively seeking out expert information that will promote rational and evidence-based decision-making to ensure health security (Greenhalgh & Wessely, 2004). Factors enabling healthism are closely linked to social determinants of health such as age and education (WHO, 2008), suggesting that healthism is more prominent among younger, more educated individuals (Greenhalgh & Wessely, 2004).

Studies investigating the role of educational attainment on vaccine hesitancy have produced mixed findings. Recent reviews providing a global perspective of vaccine hesitancy found that the relationship between educational attainment and vaccine hesitancy was context-specific and varied across countries (Larson et al., 2014; Dubé, Vivion, & MacDonald, 2015). Some studies have found lower educational attainment to be associated with greater distrust in the medical community, greater concern with vaccine safety, and less

belief in the necessity and efficacy of vaccines (Prislin et al., 1998; Gust et al., 2003; Shui et al., 2006; Peretti-Watel et al., 2014). In contrast, other findings have shown the opposite to be true, with highly educated individuals demonstrating greater concern with vaccine safety and increased vaccine refusal (Smith et al., 2004; Opel et al., 2011b). Importantly, previous research did not investigate whether the interrelationships between education and vaccine hesitancy are associated with vaccine receipt.

A significant relationship between respondents' education and the endorsement of beliefs about vaccine safety prompted the investigation of a moderating effect of education on the relationship between beliefs about vaccine safety and reported receipt of the seasonal influenza vaccine. Interestingly, of respondents demonstrating stronger agreement with beliefs depicting vaccine risks (i.e., vaccine safety), those with higher educational attainment reported lower agreement with the statement 'I usually get the seasonal flu vaccine' (i.e., reported receipt of the seasonal influenza vaccine) compared to respondents with lower educational attainment. Findings from the present study indicate that although negative vaccine beliefs (e.g., concern with vaccine safety) might be endorsed to a greater extent by individuals with lower educational attainment (as demonstrated by the negative correlation between respondents' education and agreement with beliefs about vaccine risks), these individuals are more likely to receive the seasonal influenza vaccine as compared to individuals with higher educational attainment who also demonstrate higher levels of agreement with negative vaccine beliefs. This finding highlights the importance of a multi-factor approach to investigating the relationship between the determinants of vaccine hesitancy and subsequent vaccine receipt (Larson et al., 2014).

A possible interpretation of the aforementioned finding might also relate to Peretti-Watel et al.'s (2015) two-dimensional map, distinguishing between 'rationalized' and

‘passive’ forms of vaccine hesitancy. Specifically, individuals with higher educational attainment are believed to be more likely to endorse a lifestyle guided by healthism, resulting in an active desire to exert control over their health and engage in autonomous decision-making (Greenhalgh & Wessely, 2004). This active engagement in vaccine decision-making may result in either ‘enlightened conformism’ with vaccination programs or ‘rationalized hesitancy’ (Peretti-Watel et al., 2015). Individuals demonstrating rationalized hesitancy may be more likely to refuse vaccination because of heightened concern with vaccine safety in conjunction with a lack of confidence in health authorities (Greenhalgh & Wessely, 2004; Peretti-Watel et al., 2015). In contrast, Peretti-Watel et al. (2015) suggest that individuals not as actively engaged with their own health and more indifferent towards vaccination issues are more likely to exhibit either ‘passive conformism’ or ‘passive hesitancy’ towards vaccination based on inaction and dependence (on health authority recommendations), rather than autonomous engagement. As a result, individuals exhibiting ‘passive hesitancy’ because of heightened concerns about vaccine safety may be less likely to refuse vaccination, perhaps because of greater confidence in health authorities.

Limitations

There are limitations associated with the present findings. Firstly, despite stratified sampling procedures, survey respondents had a higher level of education and income than the general population of Canada, which might result in a biased interpretation of survey results. Secondly, the interpretation of principal components is subjective, which can influence their labelling. Thirdly, the outcome variable used in the analyses (i.e., respondents’ level of agreement with the statement ‘I usually get the seasonal influenza vaccine’) limits the interpretation of findings. Specifically, factors associated with reported

receipt of the seasonal influenza vaccine are interpreted as predictors of typical past behaviour, since the outcome variable does not provide an exact indication of whether respondents had received the seasonal influenza vaccine in the past or whether they intended to receive it in the future. Finally, the mediating effect of both concern with vaccine safety and beliefs about vaccine regulation and benefits accounted for a modest proportion of the variance, as demonstrated by the small decrease in the beta coefficient of the direct effect compared to the total effect. The effect of the mediators may have been attenuated due to the fact that both variables were correlated (Preacher & Hayes, 2008). Additional research is therefore required to determine the extent to which dimensions of vaccine hesitancy (i.e., concern with vaccine safety and confidence in vaccination) mediate the relationship between age and vaccination behaviour, including but not limited to receipt of the seasonal influenza vaccine. Similarly, a small proportion of variance accounted for by the moderating effect of educational attainment on the relationship between concern with vaccine safety and reported receipt of the seasonal influenza vaccine indicates that this finding requires further investigation.

Summary and Implications

The present study represents a unique investigation of vaccine hesitancy in Canada. Findings provide important insight on the interrelationships between components of vaccine beliefs, socio-demographic characteristics, and reported receipt of the seasonal influenza vaccine. Firstly, results confirmed previous reports suggesting that increased age results in a higher likelihood of receiving the seasonal influenza vaccine, and residents of Quebec are less likely to be immunized compared to residents elsewhere in Canada (PHAC, 2012; Statistics Canada 2015). Secondly, results found that age was a significant predictor of

reported receipt of the seasonal influenza vaccine, and that the latter relationship was mediated by the endorsement of negative beliefs about vaccine safety and positive beliefs about the regulation and benefits of vaccines. Finally, results also identified a significant interaction between educational attainment and concern with vaccine safety that predicted reported receipt of the seasonal influenza vaccine.

Current public health strategies aimed at combating anti-vaccination messaging may not be effectively presenting information to audiences who are in fact more likely to refuse vaccination because of concerns with vaccine safety. In developed countries such as Canada, individuals with higher educational attainment are considered to be more critical of health-related information and more likely to seek out alternative sources of health- and vaccine-related information, resulting in a ‘rationalised’ form of vaccine hesitancy (Greenhalgh & Wesseley, 2004; Peretti-Watel et al., 2015). Importantly, while individuals with higher educational attainment are likely to be knowledgeable in many respects, they may still lack specific vaccine-related knowledge. In light of findings indicating that individuals with higher educational attainment that endorse negative vaccine beliefs are more likely to refuse vaccination, public health strategies aimed at combating the pseudo-scientific rhetoric of anti-vaccination groups should present evidence-based information in a manner that adequately addresses the concerns of those individuals.

In conclusion, results from the present study confirm that vaccine hesitancy is a complex phenomenon resulting from interrelationships among a multitude of factors associated with vaccine hesitancy and determinants (WHO, 2014). Findings support the need for tailored intervention strategies to address vaccine hesitancy among subgroups of the population that are at an increased risk of refusing vaccination. Future studies should further investigate the role of age and educational attainment as determinants of vaccine hesitancy

and predictors of seasonal influenza vaccine receipt. Additional research is also required to determine whether these findings apply to the receipt of vaccines other than immunization against seasonal influenza. Studies should utilize a multidimensional approach to investigate vaccination behaviours in order to understand how components of vaccine hesitancy and individual, contextual, and vaccine-specific determinants can influence vaccine receipt across subgroups of the population.

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**Chapter 4: Perceptions of the Seasonal Influenza Vaccine among Healthy Adults: A
Qualitative Investigation of Determinants of Vaccine Hesitancy**

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ABSTRACT

A qualitative investigation was undertaken to explore perceptions of seasonal influenza immunization among a group of healthy adults. A total of 18 university-educated adults residing in Ottawa, Ontario participated in a series of 6 focus group discussions that covered a variety of topics on vaccines and immunization. A thematic analysis of the data identified 7 salient themes and 8 sub-themes related to contextual, vaccine-specific, as well as individual determinants of vaccine hesitancy. Themes (and sub-themes) included the Canadian context, information sources (government health authorities, mainstream media), access to immunization; perceived risk/benefit of the seasonal influenza vaccine (perceived novelty/familiarity, perceived safety, and perceived effectiveness); perceived risk of the seasonal influenza virus (perceived severity, perceived susceptibility, and perceived likelihood), personal interests, and interactions with healthcare professionals. Consistent with previous findings, individual determinants were most prominent in influencing vaccine decision-making and behaviour. Together, these results provide further insight on the multifaceted phenomenon of vaccine hesitancy in relation to seasonal influenza immunization. The relevance of perceived vaccine side effects, information deficit and information seeking were identified as important areas for future research.

Key Words: Seasonal influenza vaccine, adult immunization, determinants, vaccine hesitancy.

INTRODUCTION

Every year, 10-20% of Canadians are estimated to contract the influenza virus, and thousands of deaths, predominantly among elderly individuals, are believed to result from influenza-related complications (Health Canada, 2005; PHAC, 2015). Achieving high immunization rates against the influenza virus within the Canadian population is therefore a high priority for public health officials in Canada. Mass vaccination programs successfully prevent the transmission of infectious diseases such as influenza by achieving herd immunity, which is reliant on high population rates of immunization (Fine, Emes, & Heymann, 2011). In turn, lower immunization rates have been associated with outbreaks of vaccine-preventable diseases (De Serres et al., 2013; PHAC, 2012, WHO, 2014). Public acceptance of vaccines is therefore crucial to the success of vaccination programs.

Despite extensive promotion of influenza vaccination programs by public health officials, many individuals are choosing not to receive the seasonal influenza vaccine and adult immunization rates against seasonal influenza remain suboptimal in Canada (Statistics Canada, 2015). The adult National Immunization Coverage (aNIC) survey conducted by the Public Health Agency of Canada estimated that seasonal influenza immunization coverage for the general adult population has been less than 40% between 2001 and 2012 (PHAC, 2012).

Although only a small percentage of individuals appear to have strong anti-vaccination convictions, health authorities are worried that increased hesitancy towards vaccination will negatively affect current and future vaccination programs (Leask, 2011; Leask et al., 2012). The term “vaccine hesitancy” is increasingly used to highlight the heterogeneity of vaccine resistance, positioning individuals who are reluctant towards vaccination on a continuum ranging from complete refusal to complete acceptance of all

vaccines (WHO, 2014). Individuals characterized as hesitant are likely to delay vaccination, or accept some vaccines but refuse others. A recent report by the Strategic Advisory Group of Experts (SAGE) on Vaccine Hesitancy identified issues related to confidence (trust in vaccine and/or provider), complacency (perceived value and necessity of vaccines), and convenience (access to vaccination) as predominant aspects associated with vaccine hesitancy (WHO, 2014). Still, many other factors are believed to contribute to this phenomenon, notably those characterized by contextual (sociocultural, environmental) and individual (personal perceptions, knowledge, attitudes, and beliefs) influences and vaccine specific issues (vaccine novelty, vaccination programs) (Gowda & Dempsey, 2013; WHO, 2014; Dubé, Vivion, & MacDonald, 2015).

Previous studies have shown a strong association between public risk perception and vaccine decision-making and behaviour (Ball, Evans, & Bostrom, 1998; Chapman & Coups, 1999; Gust et al., 2003; Brewer et al., 2007; Betsch et al., 2010; Nguyen et al., 2011; Gidengil et al., 2012; MacDonald, Smith, & Appleton, 2012; Larson, Paterson, & Erond, 2012). Findings from a survey of Canadian adults revealed that perceived vaccine safety, effectiveness, and knowledge of vaccines had a significant influence on acceptance of the seasonal influenza vaccine among members of the general population (Ritvo et al., 2003). In addition, results from a meta-analysis revealed that higher perceived likelihood of contracting the seasonal influenza virus, higher perceived susceptibility towards the virus, and higher perceived severity of the consequences resulting from the virus resulted in greater likelihood of receiving the seasonal influenza vaccine (Brewer et al., 2007).

Survey findings have provided population-based accounts of vaccine attitudes and beliefs that have helped identify patterns of vaccine hesitancy across subgroups of the population (Gellin, Maibach, & Marcuse, 2000; Ritvo et al., 2003; Opel et al., 2011; Ekos

Research Associates Inc., 2011; Velan et al., 2012). Notably, a recent survey of Canadians found that the endorsement of beliefs reflecting concern about vaccine safety resulted in lower levels of reported receipt of the seasonal influenza vaccine among individuals with higher educational attainment compared to those with lower educational attainment (Perna et al., 2016b). Nevertheless, quantitative results are limited in the depth of information provided on individual attitudes and behaviours. Qualitative findings have provided deeper insight into factors associated with vaccine hesitancy (Mills et al., 2005; Benin et al., 2006; Leask et al., 2006; Downs, de Bruin, & Fischhoff, 2008; Boerner et al., 2013; Driedger et al., 2015). Qualitative investigations thus remain essential to the understanding of social phenomena affecting the health of individuals, such as vaccine hesitancy (Bourgeault, Dingwall, & De Vries, 2010).

Importantly, research on influenza immunization in healthy adults, especially qualitative in nature, is limited. To help fill this gap in the literature, the present investigation aims to provide in-depth insight on individual perceptions of the seasonal influenza vaccine and to inform future investigations on vaccine decision-making and behaviour with respect to adult influenza immunization.

METHODS

The University of Ottawa Research Ethics Board granted ethical approval prior to the undertaking of this research project.

Procedure

Participant Recruitment

Convenience sampling was used to recruit participants for the present study (Saumure & Given, 2008). Individuals residing in Ottawa, Ontario were approached by the primary research investigator to participate in a qualitative study investigating vaccine attitudes and beliefs. Groups of individuals were recruited from community organizations and a local community health centre. A snowball sampling procedure was subsequently employed to increase the total sample size (Atkinson & Flint, 2004). Participants included employees, volunteers, and clients of the local community health centre (focus groups one and five, three, and six, respectively), members of a parent-teacher group (focus group two), and coworkers of a local fundraising organization (focus group four). All participants were given a recruitment sheet that included detailed information on the study and the primary researcher's contact information. With the exception of focus group three, members of each focus group knew each other prior to participating in the study, and aspect of participant recruitment that helped to ensure that the focus groups produced fruitful discussions.

Focus Group Guide

The primary researcher facilitated all focus group discussions with the use of a guide to ensure that topics of interest were discussed. The focus group guide was comprised of open-ended questions and probes that were meant to explore participants' personal accounts of factors considered to be important drivers of vaccine decision-making and behaviour. The questions addressed issues of confidence (e.g., trust in healthcare providers), complacency (e.g., doubts about the necessity of vaccines), and convenience (e.g., accessibility of vaccines and vaccine-related information), outlined in a recent report by the Strategic Advisory Group of Experts (SAGE) Working Group on Vaccine Hesitancy (WHO, 2014), as well as perceived risks and benefits of vaccines previously identified in the literature. Questions and probes were also designed in accordance with statements included in a

national survey on attitudes and beliefs about vaccines and immunization (Perna et al., 2016ab). This survey included 23 vaccine-related statements addressing vaccine-related behaviours and beliefs about vaccines, vaccine science, perceived risk (e.g., risk-benefit trade off), uncertainty about vaccine-related information and vaccine side effects, external control (e.g., the role of regulators including government health authorities), internal control (e.g., personal responsibility), and risk acceptability.

Questions and probes in the focus group guide were organized into the following categories: vaccine knowledge; common vaccine beliefs; health- and vaccine-related sources of information; perceived value of vaccines (i.e., necessity, effectiveness, and safety); vaccine benefits, risks, and uncertainty; and the role of vaccine regulators (i.e., government health authorities, health care providers). Most of these questions were also asked specifically in relation to the seasonal influenza vaccine specifically. Participants also completed a brief questionnaire to obtain relevant socio-demographic information.

Focus Group Discussions

Participants were instructed to provide their opinions throughout the discussion, and were reminded that there were no right or wrong answers to the questions being asked. All focus group discussions began with the researcher asking participants general questions about vaccination, including “When you hear the word ‘vaccines’, what are the first words or phrases that come to mind?” and “If you had to describe or explain vaccines to someone, how would you do so?” Subsequent questions and probes focused on the following domains: common attitudes and beliefs about vaccines; what sources most frequently referred to by participants to obtain health- and vaccine-related information; whether participants considered vaccines safe, effective, and necessary in Canada; the benefits and risks of vaccines; and the role of health regulators (i.e., government, healthcare providers) in the

development and distribution of vaccines in Canada. Follow-up questions were also re-framed in relation to the seasonal influenza vaccine specifically, if the seasonal influenza vaccine had not already been discussed. All categories in the focus group guide were covered in the same order during each focus group discussion, except during the first focus group, in which the discussion was subject to time constraints and primarily guided by the participants. Focus group discussions were conducted between February and December 2014.

Analytic Strategy

Throughout the discussions, participants provided personal accounts of their own attitudes, beliefs, and experiences with vaccination, and spoke of aspects that they considered important in shaping their vaccine decision-making and behaviour. An iterative process of data collection and analysis was employed by the primary researcher, which resulted in the identification of emerging themes throughout the process of data collection and analysis. The iterative nature of the data collection and analysis enabled the researcher to be fully immersed in the data and become very familiar with the dataset.

Methods of applied thematic analysis were used to analyze the data. Thematic analysis, as defined by Braun & Clarke (2006), is “a method for identifying, analyzing, and reporting patterns (themes) within data” (p.79). This analysis involved both a deductive and inductive approach towards the identification of salient themes. “A theme captures something important about the data in relation to the research question, and represents some level of patterned response or meaning within the data set” (Braun & Clarke, 2006, p.82). A review of the literature on vaccine hesitancy and health risk perception informed the researchers about concepts associated with vaccine decision-making and behaviour

(deductive approach), which guided the coding of transcripts and the identification of emerging themes within the data (inductive approach).

The main objective of the study was to investigate perceptions of the seasonal influenza vaccine. To this end, a first step involved identifying sections of the transcripts that related specifically to the seasonal influenza virus and vaccine. These sections were screened for expected and emerging themes, which were the basis of the scheme developed to code sections of the data pertaining to participants' own experiences with the seasonal influenza vaccine. The coding scheme was revised and refined as insight into the data grew stronger and new relationships between themes were discovered.

Salient themes related to perceptions of the seasonal influenza vaccine were identified within the data and subsequently organized under three categories reflecting the determinants of vaccine hesitancy outlined in the SAGE Working Group on Vaccine Hesitancy matrix (WHO, 2014). These categories included: contextual, vaccine-specific, and individual determinants.

Techniques to Ensure the Quality of the Findings

The primary researcher was responsible for all aspects of the qualitative investigation including the design of the focus group guide, recruiting participants, facilitating all focus group discussions (data collection), transcribing the audio-recordings of all focus group discussions verbatim, and analysis of the transcripts. Several techniques outlined by Guest, MacQueen & Namey (2012) were employed to ensure the quality of the findings.

1. ***Pre-testing of focus group guide.*** Questions and probes in the focus group guide were pre-tested with a group of volunteers to ensure adequate phrasing and sequencing, and to determine the timeframe of the discussion. Questions and probes

were refined based on feedback from volunteers and guidance from an expert qualitative investigator.

2. ***Understanding the purpose of the study.*** The primary researcher was responsible for the design of the focus group guide and facilitated all focus group discussions. The primary researcher (data collector) was therefore able to effectively probe participants in all focus group discussions. Issues that may arise when multiple researchers are involved in the data collecting process, such as poor understanding of the research objectives and questions, were therefore avoided.
3. ***Verbatim transcription.*** The primary researcher transcribed audio-recordings of all focus group discussions verbatim, ensuring ‘the best representation of the data collection event’ (Guest, MacQueen & Namey, 2012; p. 96).
4. ***Secondary review of coding.*** The primary researcher was responsible for coding the data. In the case of a single coder, a review of some or all coding following a time lapse can serve to ‘refresh one’s perspective and help temper any temporary distorting effects immersion in the data can cause’ (Guest, MacQueen & Namey, 2012; p. 92). The primary researcher reviewed and refined the coding scheme over a period of several months.
5. ***Negative and deviant case analyses.*** Despite the homogenous nature of the study sample with respect to educational attainment, the personal accounts of some participants deviated from commonly expressed views in several instances. Negative or deviant cases were included in the study findings.
6. ***The use of quotes.*** Study findings include numerous quotes provided by participants from all focus group discussions to enable a rich, thick description of the data. Participant quotes were labelled in reference to their socio-demographic

characteristics outlined in Table 2, which provides the reader with a better sense of context (Pitchforth et al., 2005).

7. **Addressing Biases.** The primary researcher remained neutral when facilitating focus group discussions, acknowledged her position towards seasonal influenza vaccination and was transparent about her views if inquired by participants. Importantly, the analysis of the data was guided entirely by the study objective, which was to provide in-depth understanding of vaccine decision-making and behaviours in relation to seasonal influenza immunization.

RESULTS

Participants Characteristics

This qualitative investigation analyzed data from 6 semi-structured focus group discussions with a total of 18 adults residing in Ottawa, Ontario. Socio-demographic characteristics of the focus group participants are given in Table 1. Focus group discussions lasted between 1.0 and 1.75 hours and included 2 to 5 participants per group. Five focus groups (FGs) were conducted in English and one focus group (FG2) was conducted in French. Participants included 14 women and 4 men between the ages of 25 and 68 ($M = 42$ years), and more than half were parents.

An important characteristic of the sample is that almost all participants had a university-level education. Educational attainment has been suggested to play an important role in vaccine decision-making, although findings are mixed and context-specific (Larson et al., 2011). Some findings suggest that higher educational attainment results in greater concern with vaccine safety and increased vaccine refusal (Smith, Chu, & Barker, 2004; Opel et al., 2011b; Perna et al., 2016b). Quantitative findings from a national survey

conducted prior to the qualitative investigation revealed that among individuals with greater concern about vaccine safety, those with higher educational attainment reported lower levels of agreement with the statement ‘I usually get the seasonal flu vaccine’ compared to those with lower educational attainment. Thus, it is of particular interest for qualitative findings to determine the factors associated with decision-making and behaviour in relation to the seasonal influenza vaccine among individuals with higher educational attainment (i.e., with a university education). As the sample included only one participant with less than a college education, the present findings largely reflect the accounts of highly educated individuals.

Throughout the discussions, more than half of the participants (n = 11) reported never receiving the seasonal influenza vaccine¹, whereas the remainder (n = 7) reported being immunized against the seasonal influenza virus on an annual basis².

¹ One participant mentioned receiving the seasonal influenza vaccine only once when she was pregnant.

² One participant reported receiving the vaccine for the first time last year and again this year.

Table 1. Socio-demographic information for participants (P) in each focus group (FG).

	Age	Gender	Language	Citizenship	Parent	Education	Influenza Immunization*
FG1							
P1	36	F	English	Canadian	No	University (Undergraduate)	No
P2	40	M	English	Canadian	No	University (Undergraduate)	Yes
P3	39	F	English	Canadian	Yes	University (Undergraduate)	No
P4	33	F	English	Canadian	No	Graduate School (Masters)	Yes
P5	40	F	English	Canadian	No	University (Undergraduate)	No
FG2							
P1	41	F	French	Canadian	Yes	Graduate School (Masters)	No
P2	38	F	French	French	Yes	Graduate School (Masters)	No
P3	44	F	French	Canadian/French	Yes	Graduate School (Masters)	No
P4	49	F	French	Canadian	Yes	Graduate School (Masters)	Yes
FG3							
P1	62	M	English	Canadian	Yes	Graduate School (PhD)	Yes
P2	42	F	English	Canadian	No	Graduate School (Masters)	No
FG4							
P1	26	F	English	Canadian	No	Some University	No
P2	25	F	English	Canadian	No	College Diploma	Yes
P3	33	M	English	Canadian	Yes	University (Undergraduate)	No
FG5							
P1	30	F	French	Canadian/Cameroonian	Yes	Graduate School (Masters)	Yes
P2	43	F	Mandarin	Canadian	Yes	University (Undergraduate)	No
FG6							
P1	66	M	English	Canadian	Yes	High School	Yes
P2	68	F	English	Canadian	Yes	University (Undergraduate)	No

NOTE: Language = Language spoken most often at home.

*Participants who reported being immunized against seasonal influenza annually (with the exception of P1 in FG5, who reported receiving the seasonal influenza vaccine for the first time last year an again this year).

Themes

Thematic analysis of transcripts from focus group discussions identified 7 themes and 8 sub-themes within sections pertaining specifically to participants' perceptions of seasonal influenza immunization of transcripts from focus group discussions. Themes and their respective sub-themes were organized under contextual, vaccine-specific, and individual determinants of vaccine hesitancy (WHO, 2014), as summarized in Table 2. Detailed results are presented in sections depicting the salient themes and sub-themes identified in relation to contextual, vaccine-specific, and individual determinants.

Table 2. A description of emergent themes and sub-themes categorized within determinants of vaccine hesitancy.

Determinants of Vaccine Hesitancy	Themes	Sub-themes	Descriptions
Contextual			
	Canadian context		Occurrence and prevention of seasonal influenza in Canada
	Sources of information		
		Government health authorities	Information sharing via government health authorities
		Mainstream media	Information sharing via mainstream media
	Access to immunization		Ease of receiving the seasonal influenza vaccine
Vaccine specific			
	Perceived risk/benefit – seasonal influenza vaccine		
		Perceived novelty/familiarity	New formulation of the vaccine vs. consistent immunization schedule
		Perceived safety	Vaccine side effects
		Perceived effectiveness	The vaccine is effective in preventing influenza
Individual			
	Perceived risk – seasonal influenza virus		
		Perceived severity	Severity of the health consequences of contracting the influenza virus
		Perceived susceptibility	Personal susceptibility of experiencing serious health consequences from contracting the seasonal influenza virus
		Perceived likelihood	Perceived likelihood of contracting the seasonal influenza virus
	Personal interests		Emphasis on personal vs. societal interests
	Interactions with healthcare professionals		Role of healthcare provider recommendations

Contextual Determinants

Canadian Context

In their discussions, participants emphasized the ‘Canadian’ aspect of the seasonal influenza virus and the vaccine administered to protect against the former. Specifically, some participants characterized the seasonal influenza virus as a ‘North-American’ issue, suggesting that concerns about ‘flu epidemics’ were particular to Canada and the United States. This observation was used to reinforce the notion that there might be something unique in Canada that is contributing to higher rates of the influenza virus.

“I just don’t think the flu, and I’m sorry to say this, I just think it’s very much North American. [...] I don’t know what this preoccupation is with the flu vaccine and I don’t think other parts of the world have such a focus, single-minded focus, on it as there seems to be here in North America. At least that’s based on my experience; it’s just [in] Canada and the US. Much so in the US too, but these two countries [Canada and the US] are the ones going on about flu vaccines, flu vaccines, flu vaccines. I honestly haven’t heard about it in other places.” (P2, FG3)³

“I thought that we [Canada] were one of the few places in the world that did mass, publicly funded, annual flu vaccinations.” (P3, FG1)

“And we know that we have four seasons [and] allergies in Canada, you know. So it’s 50/50 – I might take it or I might not take it [the seasonal influenza vaccine]. But if I was in another country, I wouldn’t even take the flu vaccine.” (P1, FG5)

³ Quotes provided as examples are drawn from focus group discussions conducted in English and French. The primary researcher translated quotes from discussions conducted in French.

In Canada, immunization against seasonal influenza is recommended by public health officials in conjunction with other modes of prevention such as regular hand washing and a healthy diet (Health Canada, 2015). Some participants mentioned that these other modes of prevention, which were viewed as being largely effective and without any potential health risks, should be emphasized more as means of preventing the transmission of infectious diseases such as influenza.

“[Canada] is a country where there are natural means of protection, in the sense that well there is water...in Canada we have an abundance of water, we can wash our hands, we can...there are all sorts of products [out there] to protect ourselves.” (P4, FG2).

Recognizing the implementation of mass immunization campaigns for seasonal influenza in Canada, one participant explicitly stated not feeling the need to be immunized against seasonal influenza based on the perception that enough Canadians were typically immunized each year.

“I don’t know if I would take it, because I think enough Canadians have taken the flu vaccine to make it worth while. So if a good percentage of Canadians are taking the flu vaccine, then there’s less value in me taking it. But you know, maybe I would take the vaccine if Canadians you know, took it at a lower percentage.” (P3, FG4).

A ‘free loading’ effect, whereby individuals do not feel a personal responsibility to be immunized in light of high immunization rates in the population (i.e., herd immunity) (Smith et al., 2013), is believed to contribute to complacency towards vaccination (WHO, 2014). Overall, participants’ emphasis on the ‘Canadian context’ appeared to depict a sense of security with respect to their environment, paradoxically resulting in the questioning of the

necessity of vaccines in this particular context (i.e., high public health security and low threat of illness).

Sources of Information

Government Health Authorities

Consistent with previous findings, the most common sources that participants referred to for health- and vaccine-related information were healthcare professionals (e.g., family physicians) and Internet websites, primarily government and health ministry websites such as Health Canada, and Google searches (Ekos Research Associates, 2011). Participants in some focus groups discussed their discontent with the way public health messaging conveyed a simplistic approach towards encouraging immunization.

“Maybe that’s the problem with the public health messages is [that] they’re uniform, they don’t recognize diversity. So it’s like the messages are simple like get your flu vaccine, wash your hands, like eat healthy foods but then people need more...” (P5, FG1)

Confidence in public health policies and recommendations about health-related issues, including vaccination, is an important factor in public decision-making (Larson et al., 2011; WHO, 2014). Most participants reported referring to and being confident in the information provided on government websites. Health Canada was mentioned most frequently as a credible source of health- and vaccine-related information.

“I would say that I am very confident in Health Canada, in the information provided by Health Canada” (P1, FG2)

Few participants were sceptical about the information provide by health authorities; however, one participant was particularly critical about the information provided by Health Canada with respect to the number of deaths resulting from seasonal influenza.

“I guess I have very little faith in research that’s being done on it [seasonal influenza] and the statistics that we’re collecting about it. I read somewhere about how the Canadian government one year, changed the statistical formula that they use to collect information about who’s dying from the flu, and when they changed it, the number [of deaths associated with influenza] tripled. Not because of [actual deaths from influenza], but just because they were calculating it differently.” (P3, FG1)

Importantly, criticism of the Canadian government, led by Steven Harper and the conservative party of Canada, ‘silencing researchers’ was highly publicized by media outlets during the period of time when focus group discussions took place (e.g., *The Globe and Mail*, 2014). Finally, despite overall confidence in the government authorities, participants often mentioned feeling as though they lacked general information on the influenza vaccine.

“My decision for last number of years has been not to get the flu vaccine, probably because I feel like I don’t have enough information.” (P1, FG1)

Mainstream Media

Members of the general public often acquire much of their health-related information from mainstream media (Krewski et al., 2012). Some participants questioned the role of the media in influencing public decision-making by presenting information in a manner that would evoke emotional responses towards contracting the influenza virus.

“This year too there’s like talk about like exactly what P4 was mentioning, like a scarier strain of flu is out this year. So I think that and you do hear about that in the media and I do think that raises your anxiety level about it.” (P5, FG1)

Participants also questioned the extent to which the media's portrayal of influenza-related deaths was related to population rates of vaccine coverage.

"I think it was last month, it was on the news or something, '200 and some odd Canadians now die from the flu'. So I don't know if that's a fear factor to get more people to get the flu shot or not? It seems like a little bit of a tactic. You know, scare the public and say 'oh we had so many deaths'. Well, is that really relevant to [getting] the flu shot or not?" (P1, FG6).

Access to Immunization

In their discussions, participants spoke about how the seasonal influenza vaccine had become increasingly accessible in Ottawa during this 2013-14 flu season.

"Yes it [access] is pretty good. Everywhere basically. Shoppers Drugmart, community health centers...you see the signs everywhere 'you can take the flu shot here!'" (P2, FG5)

"It doesn't matter where we go nowadays, every pharmacy now has a big sign out 'come in for you flu shot! Free flu shot!'" (P1, FG6).

Interestingly, participants who reported receiving the vaccine on annual basis and those who reported never receiving it mentioned that increased accessibility of the vaccine would not influence their decision to be immunized.

"No [it would not influence my decision]. It [increased access] just facilitates it [receiving the vaccine]. So I would go one way or another and get it." (P1, FG3)

"No I don't think it [not receiving the influenza vaccine] is an issue of access. I think that it's, you know accessibility is pretty good and it's not an issue of access." (P3, FG4)

In contrast, one participant who reported receiving the seasonal influenza vaccine for the first time last year, mentioned that her decision to receive it again this year was influenced by convenience.

“But the fact that they [the employer] said that they will have it available for staff and volunteers was... I think it played into my decision. So I was like, ok it’s available, you know. But then I missed those days, I wasn’t working those days, but I had already put it in my mind that I’m going to have it [the influenza vaccine] this year.” (P1, FG5)

Vaccine Specific Determinants

Perceived Risk/Benefit of the Seasonal Influenza Vaccine

Perceived Novelty/Familiarity

While most of the ‘basic’ vaccines mentioned by participants are typically administered once in a lifetime (immunization for some diseases may require a booster inoculation), the composition of the seasonal influenza vaccine is re-formulated annually according to varying strains of the influenza virus (Health Canada, 2005). The implicit novelty associated with the annual reformulation of the seasonal influenza vaccine was mentioned as a reason for increased scepticism about whether or not to receive the vaccine.

“They will have six months to conduct studies to produce the new vaccine for next year...do they even have enough time to understand what it is? So this means that it [the influenza vaccine] changes every time [year].” (P1, FG2)

“I think it’s [because] the flu comes up every year and so every year it’s kind of like ‘should I or shouldn’t I?’ Tetanus is once every ten years and I’m not

quite sure why tetanus feels ok to me...maybe it's because it's once every ten years! Like I'm not getting a vaccine [once] every 365 days..." (P1, FG1)

In contrast, participants also spoke of their familiarity with the influenza virus and the vaccine, which is available and encouraged at approximately the same time every year and has become part of an annual routine for many.

"The flu I think is around us all the time right, like it's common. It's very, very common." (P2, FG2)

"We're so brainwashed into [getting] the flu vaccine every year that it's just like: "Oh! November, flu time! Let's get the flu shot." The odd time you know it's [advertised] on TV or the radio or in the paper, but most times now you know its just November comes around, flu shot!" (P1, FG6)

Perceived Effectiveness of the Vaccine

Participants spoke about the effectiveness of the seasonal influenza vaccine predominantly in relation to the novel composition of the vaccine, which is reformulated annually to account for the most common strains of the influenza virus (Health Canada, 2005).

"The flu vaccine I think, because they can only really guess which flu strain you're going get, it's like a 50/50 chance. And so it's effective if they guessed correctly, if not then..." (P2, FG4)

Interestingly, participants quantified the perceived effectiveness of vaccines, indicating lower levels of effectiveness associated with the seasonal influenza vaccine compared to other vaccines.

"But I think for me the flu shot it never works 100%, whereas tetanus [vaccine] does, polio [vaccine] does." (P4, FG1)

Participants who mentioned being immunized against seasonal influenza annually because of pre-existing conditions, such as asthma, indicated that the vaccine was highly effective in preventing the development of conditions deemed more serious, such as pneumonias and sinus infections.

“I have a tendency to have a lot of sinus infections, but I realized that since I’ve gotten the seasonal flu vaccine, I don’t have sinus infections in the winter! I spend my winters without sinus infections!” (P4, FG2)

In addition, some participants spoke of the effectiveness of the seasonal influenza in preventing morbidity and mortality on a population-level, stating that many deaths in the population are likely prevented from mass vaccination.

“It [the seasonal influenza vaccine] is important for stopping the spreading of disease and making people really sick and stopping people from dying from it [the influenza virus] for sure.” (P4, FG1)

Perceived Safety of the Vaccine (Vaccine Side Effects)

Participants were largely confident in the safety of the seasonal influenza vaccine and those that reported having received the vaccine on an annual basis indicated never having experienced any side effects, either minor or major, from the vaccine. Still, some participants mentioned an association between receiving the seasonal influenza vaccine and experiencing symptoms similar to a cold or ‘flu’.

“Once I seem to get the flu vaccine, I get a cold. But they keep telling me the flu vaccine and the cold are not related. But in my mind it is, for some reason, and a lot of other people do say ‘geez! I just got vaccinated and now I’ve got a cold!’” (P1, FG6)

“So I remember when I was new to Canada there was talk about the seasonal flu. So I talked about it with someone and he told me ‘listen, I never take that vaccine’ and I asked him why and he said ‘every time I took it I got sick’. [...] Listen it’s weird because me too once I took it [the seasonal influenza vaccine] and maybe it was that...so I started making links [between feeling ill and having taken the vaccine] and also [decided] to no longer take the [seasonal influenza] vaccine.” (P1, FG2)

Experiencing influenza-like symptoms following the receipt of the vaccine is a side effect that participants mentioned was commonly expressed by many individuals in the public. The aforementioned quotes demonstrate how some participants may employ the ‘coincidence dragon’ heuristic, resulting in the assumption that the vaccine inherently causes the effects following immunization. In contrast, some participants argued against this claim.

“And I’ve even experienced that [being sick following immunization]. But after looking into...like reading about it a bit more, it was helpful for me to be like, it’s just what I’ve learned. [...] So that’s the misconception. It’s is more that you already were sick but it’s just being brought out a lot more afterward and that’s the coincidence factor of it, whereas it’s not necessarily a causation thing about it.” (P4, FG1)

In addition, participants spoke frequently about their uncertainty regarding the long-term side effects that could result from seasonal influenza immunization.

“I’ve never taken the flu vaccine. For me it’s something like outside of your body that you inject. It’s not, for me it’s not natural...and I don’t know the side effects of it, I don’t have the information. I think about the side effects, especially long-term effects.” (P2, FG5)

Long-term effects of the seasonal influenza vaccine were also mentioned in relation to mass vaccination campaigns, in contrast to individual susceptibilities towards experiencing serious adverse events later in life.

“Who knows the long-term effects of you know like mass flu immunization. My understanding is that it hasn’t been researched and it isn’t practiced in a lot of places in the world. So how do we know what it does to the viruses or the bacteria in our bodies?” (P3, FG1)

Individual Determinants

Perceived Risk – Seasonal Influenza Virus

Perceived Severity - Consequences of Seasonal Influenza Virus

Participants distinguished 'between vaccinations throughout the discussions, characterizing most childhood vaccines as ‘basic vaccines’, whereas others, including the seasonal influenza vaccine and travel vaccines, were deemed ‘complementary’.

“I guess in my mind I make a bit of a distinction between things like the flu and things like polio...or rabies, you know?” (P3, FG1)

This distinction was predominantly based on the nature of the vaccine-preventable disease and the extent to which consequences of the disease were perceived as dreadful, specifically whether consequences of the disease were considered ‘life-threatening’ or not.

“So with like the flu vaccination, we’ve all had the flu no one died from it, like we’re ok.” (P1, FG4)

“I think the flu it’s not like a life-threatening disease...I pretty much trust that my body can fight it off, even if I have to stay home one or two days. If it’s not life-threatening, I would try to fight it off myself.” (P2, FG5)

Importantly, almost all participants, including those that reported receiving the vaccine for reasons other than personal vulnerabilities, did not feel that the seasonal influenza virus was a disease that threatened their own life. In contrast, participants acknowledged that *other* people in Canada die from seasonal influenza. This is reflective of the optimistic bias (Weinstein, 1987; Weinstein & Lyon, 1999), whereby individuals have faith in their own judgements and believe that they are less likely than others to become ill, resulting in a low perceived need for vaccination (Smith, Appleton, & MacDonald, 2013).

“And you know that people in Canada die from flu. Like it’s a life-threatening disease for a part of the population.” (P1, FG5)

Perceived Susceptibility – Complications from the Influenza Virus

In addition to the perceived severity (e.g., dread) of seasonal influenza, participants spoke about the relevance of individual susceptibilities to contracting the virus and to developing influenza-related complications that would lead to serious illness. Importantly, most participants’ spoke about whether or not they perceived themselves as particularly vulnerable to developing serious complications from the virus that would lead to negative health outcomes. Most participants (n = 14) did not feel that they were vulnerable to experiencing ‘life-threatening’ consequences from the seasonal influenza virus.

“And if I get the flu what’s the big deal? I’m you know I’ll be sick for a week or something.” (P2, FG3)

“I’ve had it [the flu] before. And it’s true that I had a fever, I was in bed, but I was able to fight it. So for me, I feel that it [the influenza vaccine] isn’t necessary.” (P2, FG2).

“Stuff like tetanus, like I don’t even question tetanus, or travelling vaccines I’m like of course I’m going to get those vaccines, and I don’t really unpack

[understand] why those are more important than the flu shot [...] like polio is very serious. The flu, I feel like I can handle it if it comes my way.” (P1, FG1)

Of those receiving the seasonal influenza vaccine annually, some participants reported being immunized to reduce the likelihood of transmitting the virus to others (e.g., individuals in the workplace, family members), whereas other participants indicated pre-existing conditions, such as asthma and sinus infections, as reasons for receiving the seasonal influenza vaccine annually. Participants that reported receiving the seasonal influenza vaccine annually and those that did not shared similar views about who benefits from being immunized.

“People that are in good health and that when they catch the flu it does not turn into a serious illness, especially pneumonia, people that are able to fight the flu do not [get the influenza vaccine]. But those people that are more vulnerable, well it is worth it [to get the influenza vaccine] definitely! I get it because like I was telling you, every winter I no loner have sinus infections. I tried it [the influenza vaccine] five years ago and it worked and since then I get vaccinated.” (P4, FG2)

Perceived Likelihood of Contracting Seasonal Influenza

Participants who reported not receiving the seasonal influenza vaccine on an annual basis mentioned never having contracted the virus, which resulted in the perception that it was not necessary for them to be immunized.

“I was just thinking maybe if I got the flu really bad one year, yes I would think [about receiving the vaccine]. But I haven’t got it [the flu] so you know... But I was the one who said that vaccination is a form of insurance... I

just thought, well I don't need it [the vaccine], why am I doing this and is it really necessary?" (P2, FG3).

"I do not get it [the seasonal flu vaccine]. I have confidence in myself and I tell myself that I will be able to fight the flu." (P2, FG2).

The above quotes are reflective of the optimistic bias (Weinstein, 1987; Weinstein & Lyon, 1999), whereby individuals chose not to be vaccinated based on their judgment that vaccine-preventable diseases pose minimal risks to their health (Smith, Appleton, & MacDonald, 2013). Specifically, individuals may be 'over-confident' in their judgement of low perceived risks associated with vaccine-preventable diseases and as result do not feel compelled to be vaccinated.

Participants assessed their likelihood of contracting the seasonal influenza virus according to the nature of their immediate environment, primarily their place of employment.

"So this year I'm working in two community health centers. [...] I was thinking that like ok my body's going to fight it, but if I'm exposed to clients who might have it you know? (P1, FG5)

"For example, my husband works in hospitals and he knows that he can be in contact with populations that are infected [with the influenza virus], so it might be more important for him to protect himself than it is for me. So I think that your environment or the place where you work can also influence [your decision to be vaccinated]..." (P2, FG2)

Most participants did not feel as though they were more likely to contract the virus and were also not weary of the consequences of the virus. Participants also spoke of other modes of

prevention, such as hand washing and wearing a mask, which they felt were effective ways of reducing the likelihood of contracting the influenza virus.

Personal Interests

Immunization is a public health intervention that is reliant on individual decision-making and behaviour to ensure community protection (i.e., achieving herd immunity; Fine, Eames & Heymann, 2011). While many participants acknowledged the societal implications of immunization, the notion that vaccination was a personal choice was emphasized throughout the discussions. Interestingly, although participants described the role of vaccination as a method to “prevent epidemics of diseases that are very contagious like the influenza virus” (P2, FG2), the importance of individual interests, particularly with respect to seasonal influenza immunization, was emphasized by participants who reported receiving and not receiving the seasonal influenza vaccine annually.

“I’ve never taken it [the vaccine] just because like I’ve never thought it was important enough to spend my time doing it.” (P3, FG4)

“I’ve had travel vaccines, but...I’ve never had a flu vaccine. It’s really stupid like it’s ‘you can’t make me have a flu vaccine’. It’s my right to say whether I’m going to have a vaccine or not, you’re not going to make me.” (P2, FG6).

Participants expressed mostly positive attitudes towards vaccines and recognized the societal importance of vaccination. Still, individual interests were primary drivers of whether or not to receive the seasonal influenza vaccine. In all instances, personal interests and perceived susceptibilities, in conjunction with a perceived lack of knowledge about influenza, appeared to override the understanding that increased immunization rates were necessary to reduce the transmission of the influenza virus.

“So in principal, everyone should take it [the seasonal influenza vaccine]. However, [there are] individual interests, like mine. I believe that I am in good health, [therefore] I don’t need to take the vaccine. But if want to be logical, if I want to help my neighbour, I should take it [the vaccine] to form like a pocket of resistance to prevent the virus from spreading from myself to other people that could be vulnerable.” (P3, FG2)

Interestingly, some participants vocalized the paradox that they faced by accepting certain vaccines but not others, notably the seasonal influenza vaccine.

“Actually I was just thinking I’m the one who’s a proponent of vaccines saying I believe in them and I’m the one who’s not taking the flu vaccine... so does that make sense you know...?” (P2, FG3).

Interactions with healthcare professionals

Interactions with healthcare professionals are consistently shown to significantly impact vaccine acceptance (Wheelock et al., 2014; Yaqub et al., 2014). In fact, physician recommendations have been shown to override initial intents to refuse vaccination (Boerner et al., 2013). Participants’ depiction of their interactions with family physicians varied. Notably, of participants that reported not receiving the seasonal influenza vaccine annually, some mentioned feeling pressured or confronted by their physicians to be immunized, whereas one participant stated that her family doctor never recommended that she receive the seasonal influenza vaccine. In response to one participants’ claim of being pressured to by her doctor to be immunized another participant stated:

“You know my doctor pressures me too. She’s like ‘oh you haven’t had your tetanus’ or whatever...and same with flu shot.” (P5, FG1)

“I’m going to my doctor at the beginning of January, and I know he’s going to tell me to get the flu vaccine and he’ll confront me about it. And so I don’t like confrontation, so I’ll probably have the flu vaccine [laughing].” (P2, FG6)

It is important to note that both participants in FG1 who reported feeling pressured by their family physicians had stronger concerns about vaccination in general compared to other participants. In contrast, participants who reported receiving the seasonal influenza vaccine annually mentioned being recommended to do so by their family physician in a way that did not engender feelings of being pressured.

“In terms of like the flu vaccine is a good example because every time I go to my family doctor it’s usually around the same time of year, and they’ve always got the flu vaccine so every time I go he’s like “oh, do you want to take the flu vaccine? It’s a good idea”, and I’m like “oh sure!” (P2, FG4)

Despite agreeing with physician recommendations, some participants expressed an overall lack of information provided by healthcare professionals.

“When we go for the flu shot for example, they don’t really tell you like the side effects, they just like give you the vaccine. As for me, I haven’t received a lot of information about vaccines. I feel that when, even for like the kids, they [healthcare professionals] should take time to explain it to us. So I don’t really have a lot of information.” (P1, FG5)

In contrast, some participants who reported receiving the seasonal influenza vaccine annually reported receiving detailed information about the risk of allergic reactions, and noted that this was particular to the influenza vaccine.

“It would be good to know, to inform people on the composition of vaccines. Because, like what they [healthcare professionals] do for the flu [vaccine] here, they will ask if you are allergic to eggs, etcetera. [...] And it’s important to have that information because I would say that...I really like that aspect of the seasonal flu vaccine. Because they [healthcare professionals] always ask that question, they have precise questions, [such as] are you allergic to this, this, or this?” (P4, FG2)

“Well like in terms of flu vaccination I think the people giving it out do a really good job of telling people ‘don’t come here if you have an egg allergy because it was like made in eggs’. So I think that’s really smart. So I think that people are pretty well prepared.” (P2, FG4)

DISCUSSION

The purpose of the present study was to (1) explore perceptions of the seasonal influenza vaccine among healthy adults and (2) identify salient themes related to contextual, vaccine specific, and individual determinants of hesitancy with respect to the seasonal influenza vaccine. Hesitancy towards vaccination is characterized as a complex and context-specific phenomenon that results from interrelationships among multiple factors, as well as contextual, individual, and vaccine-specific determinants (WHO, 2014). Canadian data on factors related to adult immunization for seasonal influenza is limited; study findings are therefore meant to inform future research on factors influencing influenza vaccine acceptance among healthy adults in Canada. Importantly, findings from the present study are interpreted in light of several determinants that are believed to shape participants’ perceptions of the seasonal influenza immunization.

Study participants represent a highly educated sample of individuals (all participants had a university education except for one older participant (P1, FG6)) that reside in urban areas near Ottawa's downtown core. Their views about seasonal influenza immunization should therefore be considered within this context. Notably, findings from the 2003 Canadian Community Health Survey indicated that residents of Ontario were most likely to receive the seasonal influenza vaccine compared to residents of other provinces (Sibley & Weiner). In 2000, Ontario was the first province to implement a universal publicly funded vaccination program for coverage of the seasonal influenza vaccine for all persons aged 6 months and older (Schabas, 2001; Erickson et al., 2005). Receipt of the seasonal influenza vaccine has also been shown to differ between individuals residing in urban vs. rural areas of Canada, with a decreased likelihood of immunization coverage among residents of rural areas (Sibley & Weiner). The majority of participants in the present study reported not receiving the seasonal influenza vaccine on an annual basis, most of whom reported never being immunized against seasonal influenza as adults. The remainder of participants reported receiving the vaccine annually, except for one participant who received it for the first time a year ago.

Overall, participants' accounts on their perceptions of seasonal influenza immunization provide insight on the relationships between contextual, vaccine-specific, and individual determinants of vaccine hesitancy and support previous findings highlighting the predominant role of dimensions of risk perception in guiding individual perceptions of seasonal influenza immunization and informing decision-making and behaviour (Kumar et al., 2012). A total of 7 themes and 8 sub-themes were categorized under contextual, vaccine-specific, and individual determinants of vaccine hesitancy, further depicting the multifaceted nature of this phenomenon (WHO, 2014). Results helped shed light on salient themes related

to individual, as well as contextual and vaccine-specific determinants, which participants considered important factors in shaping their perceptions of seasonal influenza immunization.).

Contextual Determinants

Perceptions of seasonal influenza and influenza immunization expressed by participants in the present study indicate that aspects of the environment (e.g., immediate and broader Canadian context), as well as elements associated with the influenza vaccine specifically (e.g. annual reformulation of the composition), contribute to dimensions of individual decision-making (e.g., risk/benefit trade-off) and subsequent vaccine acceptance. ‘Contextual’ themes related to the Canadian public health context, sources of information on seasonal influenza, and access to influenza immunization. Interestingly, the seasonal influenza virus was perceived as being particularly prominent in Canada and the United States, causing participants to question the structural elements that might contributed to the occurrence of annual ‘flu epidemics’ in North America; paradoxically, participants also spoke about the benefits of the Canadian public health system (e.g., access to clean water and healthy foods), and more ‘natural’ daily habits, such as hand-washing and a healthy diet, were emphasized as effective methods to prevent the transmission of the influenza virus. Contrary to participants’ perceptions, the seasonal influenza virus is present in many countries in both northern and southern hemispheres (WHO, 2006), and other developed countries also implement mass immunization programs to prevent outbreaks of influenza.

Health-related information, such as population rates of influenza-related deaths, is often presented to the public via various mainstream media outlets (e.g., television broadcasting). In fact, participants in a qualitative study mentioned acquiring information from mainstream media reporting more often than from direct government communication

(e.g., official government websites) (Boerner et al., 2013). Media coverage of health-related topics is suggested to evoke more emotional responses and influence individuals' health-related perceptions (Shrum, 2009; Boerner et al., 2013). One study reported that more frequent exposure to televised health coverage decreased the perceived risk of vaccination, suggesting that media reporting of health information could encourage vaccine acceptance (Chen, 2015). Emotional responses to media coverage of infectious diseases outbreaks, such as the H1N1 influenza A pandemic, have been shown to promote vaccine uptake as a result of increased negative emotions (e.g., fear, panic) towards the vaccine-preventable disease (Henrich & Holmes, 2009; Driedger et al., 2015). However, other studies indicate that individuals who chose not to receive the H1N1 influenza A vaccine considered media reporting overhyped and sensationalistic (Boerner et al., 2013; Taha et al., 2013, 2014). In the present study, some participants expressed anxiety in response to media portrayals of influenza-related deaths in Canada, causing them to perceive the influenza virus as a more serious threat, although this did not appear to influence their intentions to receive the vaccine. However, other participants were sceptical about the information presented and highlighted the sensationalized media reports on 'flu deaths', suggesting that reporting of the number of deaths allegedly caused by the seasonal influenza appeared to work as a 'tactic' to encourage vaccine uptake among the public. One participant also questioned the accuracy of findings on influenza-related deaths in Canada reported by the Canadian government. This participant was sceptical of the method used by government researchers to calculate influenza-related deaths, suggesting that these were overestimated. In fact, certain members of the scientific community have criticized the accuracy of reports on influenza-related deaths in Canada (Wilson et al., 2012).

The success of immunization programs in Canada, as well as the notion that there are other effective ways to help prevent the spread of illness, appeared to foster complacency towards seasonal influenza immunization. In addition to low perceived severity of the influenza virus, the perception that enough Canadians are immunized against seasonal influenza is consistent with the ‘free loading’ heuristic, which results in a lower perceived need to be immunized due to of high rates of vaccine coverage in the population (Smith et al., 2013; Boerner et al., 2013). Interestingly, most participants, including those that reported regular receipt of the seasonal influenza vaccine and those who did not, also mentioned that increased access to the seasonal influenza vaccine (e.g., vaccination provided at work, pharmacies, etc.) would not impact their decision to receive the vaccine on an annual basis; instead, individual determinants, such as perceived vulnerabilities towards the virus, appeared to motivate vaccine receipt more so than environmental cues.

Individual and Vaccine Specific Determinants

Consistent with previous findings, individual and vaccine-specific determinants reflecting dimensions of perceived risk, in relation to oneself and the influenza vaccine respectively, were identified as the most predominant aspects shaping perceptions and informing decision-making with respect to seasonal influenza immunization (Brewer et al., 2007; Kumar et al., 2012; Boerner et al., 2013; Wheelock et al., 2014; Chen et al., 2015). Specifically, perceptions of seasonal influenza immunization were predominantly based on the perceived severity of the virus (dread of the consequences), personal vulnerabilities (susceptibility to becoming seriously ill), and the perceived effectiveness (does the vaccine provide adequate protection against the influenza virus) and safety (side effects of vaccination) of the vaccine.

Vaccine Specific Determinants

Themes identified as ‘vaccine specific’ included the perceived novelty, effectiveness, and safety of the seasonal influenza vaccine in Canada. Concern about vaccine safety has been identified as the primary reason for vaccine hesitancy among members of the general public (Yaqub et al., 2014). Also, the effectiveness of the seasonal influenza vaccine in reducing influenza-related symptoms among healthy adults has been debated among the scientific community (Dimicheli et al., 2014).

In the present study, uncertainty about the safety and effectiveness of the vaccine was largely related to the varying composition of the vaccine, which is reformulated annually in order to adapt to novel strains of the influenza virus. Such reformulation resulted in the effectiveness of the vaccine being viewed as questionable and increasing uncertainty surrounding the possibility of long-term side effects. The changing composition of the influenza vaccine was also identified as a source of uncertainty among a group of adults in the United Kingdom (Wheelock et al., 2014). Participants in the present study questioned whether research was being conducted to determine the long-term side effects of influenza immunization; however, they acknowledged that this would be difficult to do in light of the novel formulation of the vaccine each year.

Participants stated that information on immediate vaccine side effects, such as allergic reactions, were adequately presented by healthcare professionals. However, a perceived lack of general information on seasonal influenza (presumably related to the virus itself and the vaccine), although not characterized in detail by participants, was mentioned frequently throughout the discussions. Participants in another qualitative investigation on adult influenza immunization also reported a perceived lack of knowledge about the seasonal influenza virus and the vaccine (Wheelock et al., 2014). Also, findings on receipt of the

H1N1 influenza A vaccine in Canada demonstrated that individuals' perceived lack of background information on this vaccine resulted in the perception that recommendations to receive the H1N1 influenza A vaccine were not based on science but instead served marketing purposes (Boerner et al., 2013). Informed decision-making has been identified as an important aspect in vaccine uptake, particularly in studies investigating receipt of the H1N1 influenza A vaccine (Kumar et al., 2012; Boerner et al., 2013). Participants in the present study remained adamant about their lack of sufficient, and perhaps more detailed, information about the seasonal influenza virus and the vaccine.

Interestingly, all participants who reported never having received the seasonal influenza vaccine acknowledged their acceptance of other 'basic' vaccines, such as childhood and travel vaccinations. Interestingly, some of these participants vocalized that their refusal to receive the seasonal influenza vaccine was inconsistent with their general beliefs about vaccination. Participants questioned the rationality of their decision not to be immunized against the influenza virus, asking themselves whether or not this made sense.

“It's not rational. Like it doesn't follow through. If I believe in one thing, why wouldn't I necessarily believe in the flu shot?” (P2, FG6)

Individual Determinants

Themes related to individual determinants included the perceived severity of the influenza virus, personal susceptibilities towards the virus, the likelihood of contracting the virus, personal interests, and interactions with healthcare professionals. Consistent with other findings, the perceived severity of the influenza virus and individual susceptibilities towards experiencing serious health consequences as a result of contracting the virus were predominant factors that shaped perceptions and informed participants' decision to receive the seasonal influenza vaccine (Nexo, Kragstrup, & Sogaard, 1999; Wheelock et al., 2014;

Kumar et al., 2012; Chen, 2015). Personal susceptibilities were characterized based on whether participants had a pre-existing condition, such as asthma, or a vulnerability, such as being prone to developing sinus infections, which made them more at-risk of experiencing serious complications from the influenza virus. In turn, participants who did not perceive themselves at-risk of developing a serious illness resulting from the seasonal influenza virus were not concerned with the symptoms they would experience if they were to ‘catch the flu’.

Promotion of the seasonal influenza vaccine by public health officials is often targeted towards at-risk groups, predominately elderly adults (i.e., adults aged 65+; Health Canada, 2015). Also, vaccination programs for seasonal influenza are not publicly funded for healthy adults aged 18 or old in many Canadian provinces (PHAC, 2015), requiring certain individuals to pay for the vaccine out-of-pocket. Together, these structural elements might further reinforce complacency among healthy adults that are not considered members of at-risk groups. In fact, previous findings have shown that perceived and actual membership in a priority (i.e., at-risk) group significantly influenced uptake of the H1N1 influenza A vaccine (Kumar et al., 2012). However, as previously mentioned, increased access to seasonal influenza immunization in Ottawa did not appear to influence participants’ decision to receive the vaccine.

Although some participants demonstrated greater concerns about the general concept of vaccination as a public health intervention, all participants expressed some concern about specific aspects of vaccination, such vaccine side effects. Notably, all participants conveyed a certain degree of resistance towards the seasonal influenza vaccine, including those that reported being immunized against the influenza virus on an annual basis. For these participants, scepticism about the seasonal influenza vaccine was overridden by perceived vulnerabilities towards developing serious complications from the influenza virus that would

result in more detrimental health consequences, as well as protecting vulnerable others in their immediate environment. Consistent with previous findings, these participants were more likely to describe the influenza virus as a potentially life-threatening disease (Wheelock et al., 2014); however, this was always based on individual vulnerabilities and participants emphasized that the vaccine was not necessary for ‘healthy’ adults.

Finally, physician recommendations to receive the seasonal influenza vaccine were perceived as positive reminders by participants who reported receiving the vaccine annually, whereas some participants who chose not to receive the vaccine felt pressured by their physicians when the topic of immunization was brought up. Surprisingly, one participant who chose not to receive the influenza vaccine annually reported that her physician had never recommended she be immunized against seasonal influenza. Importantly, while some participants reported not receiving enough information about the seasonal influenza vaccine prior to and following immunization, others who reported receiving the vaccine annually were impressed with their physicians’ explanations regarding the composition of the influenza vaccine and the risk of experiencing an allergic reaction. These participants mentioned that such detailed description of a vaccine’s composition was particular to the seasonal influenza vaccine.

Implications for Future Research – The Role of Education and Information Seeking

Keeping in mind that almost all participants in the present study were university-educated adults, a perceived lack of information, rendering the value of the seasonal influenza vaccine questionable, was mentioned throughout the discussions. Participants recognized the importance of high vaccination coverage to prevent the spread of influenza and to ensure community protection, particularly for individuals more at-risk of experiencing serious complications from the virus. However, personal interests, which were often guided

by the perception of incomplete or inconclusive information on the value of influenza immunization and the notion that healthy individuals could effectively ‘fight off’ the virus, appeared to be the primary factors guiding decision-making and behaviour with respect to seasonal influenza immunization.

“And, I don’t necessarily know why I’m...I don’t know if the science behind it [the seasonal influenza vaccine] is absolute I guess. So it’s hard for me to sort of accept the flu shot, but I do accept vaccines for the children.” (P2, FG6)

A perceived lack of information is consistently reported across quantitative and qualitative studies investigating vaccine acceptance. Importantly, information seeking behaviours might differ between individuals based on educational attainment. Specifically, it has been suggested that university educated individuals are more likely to be actively committed to understanding health-related issues, and in turn, more likely to engage in information seeking behaviours (Greenhalgh & Wesseley, 2004). A study investigating information seeking behaviours in relation to acceptance of the H1N1 influenza A vaccine revealed that despite perceptions of adequate knowledge, university students’ *need* to have sufficient information on this vaccine remained a significant predictor of information seeking (Yang, 2012). In addition, findings indicated that negative emotions in relation to the H1N1 influenza A vaccine, such as perceived adverse health effects of the vaccine, also prompted information seeking (Yang, 2012). Despite a sense of security stemming from the benefits of Canada’s public health system, participants in the present study expressed heightened uncertainty pertaining specifically to the long-term side effects of seasonal influenza immunization, relating to a perceived lack of information on these adverse effects.

“So, but in Canada we are quite safe, but you can never be safe enough. Still, you pay attention, you educate yourself, you go and read...” (P1, FG5)

Throughout the discussions, most participants emphasized the importance of credible and transparent information to promote informed decision-making with respect to vaccination. Future research aimed at improving seasonal influenza immunization coverage among healthy adults in Canada should focus on the role of perceived lack of information and information-seeking behaviours in relation to vaccine decision-making and uptake. Also, distinguishing between actual and perceived knowledge of the influenza vaccine, as well as clarifying the information that individuals perceive is needed to make informed decisions about vaccination could also help tailor informational brochures and other forms of communication between experts and the public.

LIMITATIONS

The present study is subject to certain limitations. Firstly, these findings are not transferable to a larger segment of the population. Rather, findings are limited to educated adults residing in Ottawa, Ontario. Participant recruitment was limited due to constraints on time and resources, which resulted in a relatively small sample size. Despite being unable to confirm saturation, recurring patterns across transcripts suggests that salient themes were identifiable within the data. Subsequent research will be informed by the themes identified in this study and will serve to determine whether attitudes towards seasonal influenza immunization among the general adult population in Canada is driven by similar perceptions.. For example, a comparative sample with individuals without a university education would provide valuable insight on differences according to educational attainment identified in previous quantitative studies (Perna et al., 2016ab). Findings are also limited to

perceptions of the seasonal influenza vaccine specifically; as such, other themes that may relate to other vaccines were not reported in the present study. Finally, study findings are limited to the interpretation of the primary researcher. Indeed, a lack of inter-coder agreement among multiple analysts is acknowledged as a methodological limitation of the present study. However, some researchers argue that measures of inter-coder reliability, such as a Kappa coefficient, are not always appropriate for small samples sizes, and that analyses are not necessarily enhanced with multiple coders if the latter were not involved in collecting the data (Morse, 1997). Several techniques, described in the methods section, were used to ensure the quality of the findings (Guest, MacQueen & Namey, 2012). For example, the use of quotes from participants across all focus groups was a key aspect in ensuring a fulsome description of the data and validating the interpretation of results. The diversity of the quotes, obtained from the accounts of participants within all six focus groups, demonstrates the relevance of themes that emerged from the discussions among the study participants. Despite these measures, the potential for biases in the analysis of the data and interpretation of findings due to the interpretation of a single individual remains.

CONCLUSION

Empirical research on salient factors informing seasonal influenza immunization among healthy adults in Canada is limited. The present study provides valuable insight on factors related to contextual, individual, and vaccine-specific determinants that are likely to inform decision-making and behaviour related to seasonal influenza immunization among healthy adults. Certain participants expressed greater concerns about vaccination in general, and were also more critical of the information provided by mainstream health authorities; still, all participants were quick to distinguish the seasonal influenza vaccine from other ‘basic’

vaccinations, such as childhood immunizations, which were perceived as more necessary based on the gravity of the diseases they prevent. Together, salient themes related to contextual, vaccine-specific, and individual determinants of seasonal influenza immunization were indicative of a low perceived value of the seasonal influenza vaccine for healthy adults. Future studies should further investigate the relative weight of these factors on influenza immunization among a more representative sample of Canadian adults.

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Chapter 5: General Discussion

The overarching objective of this thesis was to explore the phenomenon of vaccine hesitancy in Canada by assessing the attitudes and beliefs of Canadian adults regarding vaccines and immunization, and investigating how factors associated with vaccine hesitancy relate to reported receipt of the seasonal influenza vaccine. Both quantitative and qualitative research methods were employed to examine differences in vaccine attitudes and beliefs across subgroups of the Canadian general population and to provide greater insight into the factors associated with individual perceptions of seasonal influenza immunization influencing vaccine decision-making and behaviour.

A first study used data from a subsection of a national health risk perception survey to investigate differences in levels of agreement with vaccine belief statements based on respondents' socio-demographic characteristics. This study also identified two components of vaccine beliefs reflecting concern with vaccine safety and beliefs about the regulation and benefits of vaccines. Respondents' endorsement of negative beliefs about vaccine safety and positive beliefs about the regulation and benefits of vaccines were shown to differ based on age and educational attainment. Also, both components of vaccine beliefs were significant predictors of vaccine-related behaviours, including discourse about vaccines with others and reported receipt of the seasonal influenza vaccine.

A second study aimed to provide further insight on interrelationships among components of vaccine beliefs, socio-demographic characteristics, and reported receipt of the seasonal influenza vaccine. Findings revealed that higher likelihood of receiving the seasonal influenza vaccine among older adults was associated with general beliefs about vaccination, including lower concern about vaccine safety and stronger endorsement of the regulation and benefits of vaccines, whereas the opposite was true for younger adults.

Findings also provided insight on the relationship between educational attainment and negative beliefs about vaccine safety, indicating that among individuals with greater concern with vaccine safety, those with higher educational attainment reported lower levels of agreement with the statement ‘I usually get the seasonal flu vaccine’ compared to those with lower education attainment.

Keeping in mind the complex and context-specific nature of vaccine hesitancy (Larson et al., 2014; WHO, 2014b), a third study sought to provide more in-depth insight on salient factors associated with seasonal influenza immunization using data from focus group discussions. This qualitative investigation analyzed participants’ personal accounts of their attitudes and beliefs about the seasonal influenza vaccine and identified salient factors related to contextual (Canadian context, information sources, and access to immunization), vaccine specific (dimensions of perceived risks/benefits associated with the influenza vaccine), and individual determinants (dimensions of perceived risk associated with the influenza vaccine, personal interests, and interactions with healthcare professionals) of vaccine hesitancy. Qualitative findings inform future studies on barriers towards acceptance of the seasonal influenza vaccine among healthy adults.

Collectively, findings provide valuable insight on: varying levels of agreement with vaccine-related beliefs across subgroups of the Canadian population; the interrelationships among dimensions of vaccine hesitancy, socio-demographic characteristics, and reported receipt of the seasonal influenza vaccine. Salient factors related to perceptions of seasonal influenza immunization across contextual, vaccine specific, and individual determinants of vaccine hesitancy (WHO, 2014b) were also documented. Findings from each study and their implications are discussed in detail the sections below.

The Social Differentiation of Vaccine Attitudes and Beliefs

The emerging concept of ‘vaccine hesitancy’ suggests that vaccine resistance is a heterogeneous phenomenon that results from interrelationships among a multitude of factors (WHO, 2014b). Furthermore, the relative weight of influence of these factors on vaccine receipt is said to relate to contextual, individual, and vaccine specific determinants (WHO, 2014b). Vaccine hesitancy ‘de-polarizes previous characterizations of individuals and groups as either anti-vaccine or pro-vaccine’ (Larson et al., 2014, p. 2150), and instead suggests that individuals who are hesitant may refuse some vaccines and accept others, delay vaccination, or accept vaccines but remain unsure about doing so (Benin et al., 2006; Opel et al., 2011a; Dubé et al., 2013; Larson et al., 2014). In fact, hesitant attitudes can be exhibited by people who have not yet rejected vaccination, and research ‘focusing on only vaccine uptake rates and neglecting underlying attitudes is likely to underestimate the challenge of maintaining vaccine coverage in the future’ (Yaqub et al., 2014, p. 6).

Most of the research to date has investigated factors associated with parental acceptance of childhood vaccines (Dubé et al., 2013; Gowda & Dempsey, 2013; Larson et al., 2014). From this body of literature, a global review of research on vaccine hesitancy identified levels of income and education as key determinants of vaccine hesitancy (Larson et al., 2014). Importantly, the relationship between these determinants and vaccine acceptance was shown to differ based on the country where the investigation took place. For example, education was identified as either a barrier or as a promoter of vaccination depending on the country in which research on vaccine hesitancy was conducted (Larson et al., 2014; Dubé, Vivion, & MacDonald, 2015). A noticeable absence of Canadian data in this review further emphasized the need for research on factors associated with vaccine hesitancy in Canada.

A subsection of a national health risk perception survey was therefore designed to address the attitudes and opinions of a sample of Canadians on numerous vaccine-related beliefs and to determine whether levels of agreement with these beliefs differed according to respondents' socio-demographic characteristics (i.e., gender, age, education, and parental status). Overall, responses to most survey statements were indicative of positive vaccine attitudes among this sample of Canadians; however, responses to statements pertaining to adverse events associated with vaccination, particularly long-term vaccine side effects, demonstrated heightened uncertainty and concern about whether vaccination could result in harmful consequences. Concern with vaccine safety has consistently been identified as a predominant reason for vaccine hesitancy among members of the general public (Yaqub et al., 2014). Findings from the present study indicate that vaccine safety is an important issue among this sample of Canadians. A striking finding was that almost one third of survey respondents indicated not knowing and/or having no opinion about whether the MMR vaccine can cause autism. In addition, nearly one fifth of respondents also indicated not knowing and/or having no opinion about whether a vaccine that protects against more than one disease is more likely to cause serious side effects. The CDC, Health Canada, and the WHO have previously recognized both beliefs as 'common vaccine misconceptions' (CDC, 1999; 2007; Health Canada, 2011; WHO, 2015). An abundance of empirical data has consistently disproven these claims (Taylor et al, 1999; Wilson et al., 2003; Editors of the Lancet, 2010; Jain et al., 2015): persistent public uncertainty about these issues is therefore somewhat surprising, and reinforces the notion that safety concerns remain an important factor in public perceptions of vaccination (Yaqub et al., 2014).

Identifying individuals that either agree with or are uncertain about these claims is important to better inform vaccine risk communication to hesitant subpopulations.

Differences in agreement (as well as reported uncertainty and/or lack of opinion) with these 2 belief statements were investigated according to several socio-demographic characteristics (i.e., gender, age, education, and parental status). Results identified differences based on gender and educational attainment. Differences with respect to educational attainment were particularly complex. Specifically, while respondents *without* a university education were more likely to report being uncertain and/or having no opinion about the purported link between the MMR vaccine and autism (whereas respondents with a university education were more likely to disagree with this statement), respondents *with* a university education were more likely to report being uncertain and/or having no opinion about the notion that a vaccine that protects against several diseases is more likely to cause serious side effects (whereas respondents without a university education were more likely to agree with this statement). These findings suggest that both individuals with and without a university education may be uncertain about some ‘common vaccine misconceptions’, which may stem from a lack of knowledge or a misunderstanding of vaccine information (MacDonald, Smith, & Appleton, 2012; Marshall, 2013). These findings may also be related to or other sociocultural factors, including widespread anti-vaccine messaging via the Internet and social media (Kata, 2012), which result in heightened public uncertainty about the risks associated with vaccines.

A principal components analysis performed with the remaining vaccine beliefs statements identified 2 components reflecting beliefs about vaccine safety and beliefs about the regulation and benefits of vaccines. Differences in agreement with statements within both components were observed with respect to educational attainment and age, suggesting that older respondents and respondents with a university education exhibit more positive attitudes towards vaccines and vaccine regulators compared to younger respondents and

respondents without a university education. Overall, differences based on educational attainment are consistent with some previous findings reporting more negative vaccine attitudes and beliefs among individuals with lower educational attainment (Prislin et al., 1998; Gust et al., 2003; Shui et al., 2006; Peretti-Watel et al., 2014; Larson et al., 2014); however, other findings have reported the opposite to be true (Smith et al., 2004; Opel et al., 2011b; Larson et al., 2014).

Finally, both components of vaccine beliefs were significant predictors of vaccine-related behaviours, accounting for a substantial amount of variance particularly in reported receipt of the seasonal influenza vaccine. Consistent with previous findings (Chapman & Coups, 1999; PHAC, 2012), age was also a significant predictor of reported seasonal influenza immunization. The relationship between age and reported receipt of the seasonal influenza vaccine might be explained by the aforementioned age differences in vaccine beliefs, which are likely shaped by various sociocultural factors (Velan et al., 2012). Relationships among components of vaccine beliefs, socio-demographic characteristics (particularly age and education), and reported receipt of the seasonal influenza vaccine were addressed in a subsequent study.

Clarifying Interrelationships Between Vaccine Beliefs and Reported Influenza

Immunization Across Subgroups of the Adult Population

Larson et al. (2011, 2014) recently articulated a call for research to identify the characteristics of hesitant subpopulations and examine the interrelationships of multilevel factors that contribute to vaccine hesitancy. The absence of a national vaccine registry in Canada limits opportunities to investigate differences in seasonal influenza immunization across the entire population and identify vaccine hesitant subgroups to better tailor

intervention strategies aimed at promoting vaccine acceptance (WHO, 2013; Nowak et al., 2015). Data collected in the vaccine subsection of the 2012 national health risk perception survey aims to fill this gap.

Findings from the first study revealed important differences in the endorsement of various vaccine beliefs based on socio-demographic characteristics, particularly age and educational attainment. Findings from this first study also identified age and components of beliefs about vaccine safety and about vaccine regulation and benefits as significant predictors of reported receipt of the seasonal influenza vaccine. A second study was therefore undertaken to investigate in greater detail the relationships between socio-demographic characteristics and reported receipt of the seasonal influenza vaccine, as well as whether the relationship between vaccine beliefs and reported receipt of the seasonal influenza vaccine varies according to socio-demographic characteristics.

Firstly, differences in reported receipt of the seasonal influenza vaccine revealed that respondents aged 65+ years reported higher agreement with the statement 'I usually get the seasonal flu vaccine' (i.e., reported receipt of the seasonal influenza vaccine) compared to respondents aged 55-64 years. Respondents from both age categories reported significantly higher agreement with this statement compared to younger groups of respondents. Findings are consistent with those from the adult National Immunization Coverage (aNIC) survey (PHAC, 2012), which indicated that increased age results in a higher likelihood of receiving the seasonal influenza vaccine. Reported receipt of the seasonal influenza vaccine was also shown to vary based on respondents' area of residence. Specifically, respondents residing in Quebec and respondents residing in rural areas in Canada reported lower agreement with the statement 'I usually get the seasonal flu vaccine' compared to respondents residing in other Canadian provinces and respondents residing in urban areas, respectively. These findings are

also consistent with reports from other Canadian surveys (Statistics Canada, 2015; Sibley & Weiner, 2011), and are likely attributable to socio-political factors, including discrepancies in funding for adult influenza immunization programs across Canadian provinces (PHAC, 2015), and geographical barriers limiting access to vaccination in some areas more than others.

Subsequent analyses were conducted to further evaluate the interrelationships among socio-demographic characteristics, components of vaccine beliefs, and reported receipt of the seasonal influenza vaccine. Firstly, significant relationships between several socio-demographic characteristics, components of vaccine beliefs, and reported receipt of the seasonal influenza vaccine were identified in a correlation matrix. A subsequent hierarchical linear regression analysis revealed that while controlling for socio-demographic characteristics of interest, both components of vaccine beliefs (i.e., concern about vaccine safety, and vaccine regulation and benefits), in addition to age, were significant predictors of reported receipt of the seasonal influenza vaccine.

Further investigation revealed that both components of vaccine beliefs significantly mediated the relationship between age and reported receipt of the seasonal influenza vaccine. Specifically, findings suggest that the higher likelihood of older adults receiving the seasonal influenza vaccine is in part related to less concern about vaccine safety and higher endorsement of the regulation and benefits of vaccines. In contrast, lower likelihood of younger adults receiving the seasonal influenza vaccine is in part associated with greater concern with vaccine safety and lower endorsement of the regulation and benefits of vaccines. Importantly, the components of vaccine beliefs that acted as mediators were of beliefs about vaccines *in general*; components of beliefs about the seasonal influenza vaccine specifically may have exhibited a stronger mediating role. It is also important to note

that rather than measuring reported *intent* to receive the seasonal influenza vaccine in the future, survey respondents were asked to indicate their level of agreement with the statement ‘I usually get the seasonal influenza vaccine’, which assesses past experiences with receiving the seasonal influenza vaccine, assuming higher agreement with this statement indicates annual influenza immunization as recommended by health authorities (PHAC, 2015).

Older adults’ more positive attitudes towards vaccination in general may be associated with sociocultural factors, which include having witnessed the detrimental effects of other vaccine-preventable diseases. Use of the anchoring heuristic (i.e., judging the probability of future events based on past experiences or ‘anchors’; Kahneman & Tversky, 1972) among this subpopulation may therefore result in a more positive view of vaccination compared to younger generations of adults who have not witnessed events such as polio epidemics (MacDonald, 2015). Although beliefs about vaccination in general, and certainly beliefs about the seasonal influenza vaccine specifically, may inform vaccine receipt, many other factors are also likely to account for higher rates of immunization among older versus younger Canadian adults. Notably, elderly adults (i.e., aged 65+) are characterized as a vulnerable population that is at a greater risk of developing serious complications from the seasonal influenza virus (Health Canada, 2015). Older adults’ personal vulnerabilities towards certain vaccine-preventable diseases such as the shingles and influenza viruses are further reinforced by public health messaging tailored to encourage immunization primarily among vulnerable populations (Health Canada, 2015). As a result, these individuals are more likely to receive, and be receptive to, healthcare provider recommendations to be vaccinated against the influenza virus on an annual basis.

A last set of analyses investigated the separate moderating effect of educational attainment and area of residence (urban vs. rural) on the relationship between concern with

vaccine safety and reported receipt of the seasonal influenza vaccine. Findings identified a significant moderating effect of educational attainment, indicating that among individuals with greater concern with vaccine safety, those with higher educational attainment reported lower agreement with the statement ‘I usually get the seasonal influenza vaccine’ compared to those with lower educational attainment. This finding suggests that although respondents with lower educational attainment reported greater concern with vaccine safety *in general*, these individuals are more likely to receive the seasonal influenza vaccine compared to individuals with higher educational attainment who also demonstrated greater concern with vaccine safety. This finding provides valuable insight on interrelationships among negative vaccine beliefs (i.e., concern with vaccine safety), educational attainment, and reported vaccine receipt not present in the literature.

Finally, the lack of a significant interaction between concern with vaccine safety and respondents’ area of residence suggests that differences in reported receipt of the seasonal influenza vaccine between individuals residing in urban versus rural areas in Canada may not be attributed to differences in the endorsement of certain negative vaccine beliefs. Instead, differences may be associated with geographical and other structural barriers, including limited access to health and vaccination services (Sibley & Weiner, 2011; WHO, 2014b).

An In-Depth Insight on Salient Factors Associated with Adult Immunization for Seasonal Influenza

Although many studies have focused on investigating influenza immunization among elderly populations and healthcare workers (Honkanen, Keistinen, & Kivela, 1996; Telford & Rogers, 2003; Goldstein et al., 2004; Mangtani et al., 2006; Hoffmann et al., 2006; Ward

& Draper, 2008; Hollmeyer et al., 2009), data on factors associated with acceptance of the seasonal influenza vaccine among healthy adults is limited.

Findings from the first two studies indicated that several socio-demographic characteristics and components of vaccine beliefs were significant predictors of reported receipt of the seasonal influenza vaccine among a national sample of Canadian adults. Notably, differences in the endorsement of vaccine beliefs were observed according to educational attainment, which was subsequently shown to moderate the relationship between negative vaccine beliefs (i.e., concern with vaccine safety) and reported receipt of the seasonal influenza vaccine. Specifically, higher endorsement of negative vaccine beliefs (i.e., greater concern with vaccine safety) resulted in lower levels of reported receipt of the seasonal influenza vaccine among individuals with higher educational attainment compared to individuals with lower educational attainment. Recognizing the limitations of quantitative data in providing a more in-depth understanding of the factors driving vaccine decision-making and behaviour, a qualitative investigation was undertaken with a sample of educated adults to identify salient factors associated with seasonal influenza immunization, specifically. These findings can subsequently inform future studies investigating acceptance of the seasonal influenza vaccine among healthy adults in Canada.

Transcripts of 6 focus group discussions with a total of 18 participants with a university-level education (except for 1 participant) were analyzed using methods of applied thematic analysis. Discourses of interest were those pertaining specifically to the seasonal influenza virus and the vaccine. Transcripts were analyzed for expected and emerging themes, which were categorized under contextual, individual, and vaccine-specific determinants of vaccine hesitancy outlined in a matrix developed by the SAGE Working Group on Vaccine Hesitancy (WHO, 2014b, MacDonald, 2015).

The salient themes identified in this study provide additional insight on factors informing vaccine decision-making and behaviour across multiple levels of determinants. Many themes are consistent with previous findings on factors associated with influenza immunization (seasonal and pandemic), and confirm the importance attributed to individual determinants of vaccine hesitancy, particularly dimensions of perceived risk outlined in the health belief model (Rosenstock, 1974; Brewer et al., 2007; Nguyen et al., 2011; Kumar et al., 2012; Wheelock et al., 2014; Chen, 2015). Importantly, themes related to contextual, individual, and vaccine-specific determinants of vaccine hesitancy are documented within a Canadian context, although results are limited to the perceptions of educated adults residing in an urban area of Ottawa, Ontario.

Interestingly, many participants perceived Canadian public health officials to be overly preoccupied with the seasonal influenza virus, suggesting that annual influenza immunization was practiced in few countries other than Canada. Participants were critical of the information communicated by government health authorities and mainstream media, and emphasized a perceived lack of information about seasonal influenza immunization, which resulted in inaction for some. Importantly, personal interests and vulnerabilities were frequently discussed and appeared to guide decision-making and behaviours with respect to seasonal influenza immunization.

Themes pertaining to the perceived risk associated with the seasonal influenza virus, including perceived severity of the virus, perceived personal susceptibility to developing a serious illness as a result of contracting the virus, and perceived likelihood of contracting the virus based on one's immediate environment were predominant in discussions among participants in all focus groups. Participants perceived the consequences of the seasonal influenza virus as posing a relatively low risk to their health as well as to the health of other

healthy adults in Canada. In fact, most participants who reported receiving the vaccine annually emphasized their underlying medical conditions as the primary reason for receiving the vaccine, whereas others mentioned being immunized in order to protect vulnerable individuals in their immediate environment.

Dimensions of risk perception were also shown to be vaccine-specific. In all focus group discussions, participants quickly distinguished between the seasonal influenza vaccine and other ‘basic’ vaccines, such as childhood immunizations, which were deemed more necessary based on the perceived severity of the disease they prevent. Participants were particularly concerned with the potential long-term side effects of the seasonal influenza vaccine. Uncertainty about long-term side effects was associated with the perceived novelty of the seasonal influenza vaccine due to annual reformulation of its composition.

Implications of Findings

The present thesis sought to contribute insightful knowledge to a growing body of literature on vaccine hesitancy and provide much needed Canadian data on public attitudes and beliefs on a variety of vaccine-related issues. Finally, findings from this thesis also provide valuable insight on factors associated with adult immunization for seasonal influenza, which can be used to inform intervention strategies aimed at improving vaccine uptake in the adult population of Canada.

‘Profiles’ of Vaccine Hesitancy

A growing interest in identifying ‘profiles’ of vaccine hesitant individuals within and across populations has prompted leaders in the field of vaccine hesitancy to call for more investigations on interrelationships among multi-level factors that contribute to vaccine hesitancy and their subsequently impact on vaccine behaviours (Larson et al., 2014).

An important first step in addressing vaccine hesitancy is ‘audience segmentation’ (Bostrom, 1997; WHO, 2013), which aims to identify subgroups of the population that may demonstrate higher levels of vaccine hesitancy, and subsequently lower immunization rates. Previous research, as well as qualitative findings from this thesis, has demonstrated that ‘a ‘one size fits all’ approach to immunization programming and communications cannot suffice to respond to existing vaccination barriers and concerns, or meet current immunization needs’ (WHO, 2013, p. 17; Opel et al., 2009; Leask, 2011). Quantitative findings from the present thesis, derived from a national survey investigating vaccine attitudes and beliefs in Canada, have important implications for the development of tailored intervention strategies aimed at communicating vaccine information to hesitant subgroups of the population. Specifically, findings identified differences in the endorsement of negative beliefs pertaining to vaccine safety and positive beliefs about the regulation and benefits of vaccines based primarily on individuals’ age and educational attainment. These findings indicated that younger adults and adults without a university education are more concerned about vaccine safety, and adults without a university are also less confident in certain aspects of vaccine regulation and benefits compared to older adults and adults with a university education, respectively.

These findings suggest that younger adults and adults without a university education demonstrate more negative vaccine attitudes, which could result in heightened vaccine hesitancy. Importantly, vaccine hesitancy is increasingly understood as a decision-making process that results in both attitudinal and behavioural outcomes (Peretti-Watel et al., 2015). Notably, individuals who choose to be vaccinated and to vaccinate their children may still have serious doubts about doing so (WHO, 2014b). It was therefore important to observe

whether these *general* beliefs about vaccination and socio-demographic characteristics such as age and educational attainment were associated with reported vaccine receipt.

Subsequent findings revealed that general vaccine beliefs and age were significant predictors of reported receipt of the seasonal influenza vaccine, whereas education was not. This finding indicates that part of the variance in reported receipt of the seasonal influenza vaccine can be explained by age and *general* beliefs about vaccination. In addition, a more modest mediating effect demonstrated that younger adults' stronger endorsement of negative vaccine beliefs (i.e., greater concern with vaccine safety) in conjunction with a lower endorsement of positive vaccine beliefs (i.e., vaccine regulation and benefits), compared to older adults, was associated with lower agreement with the statement 'I usually get the seasonal flu vaccine'. This finding suggests that younger adults may be less likely to receive the seasonal influenza vaccine as a result of more negative attitudes about vaccines *in general*. In contrast, other findings have reported stronger opposition to vaccination in general among older adults (i.e., adults aged 50-64 years) compared to younger adults (Peretti-Watel et al., 2014). Nevertheless, a stronger association is likely to have been observed between reported receipt of the seasonal influenza vaccine and beliefs that pertain specifically to seasonal influenza immunization. Although limited, previous findings suggest that vaccine decision-making and behaviours among younger individuals is predominantly guided by higher degrees of individualism (i.e., autonomous decision-making/personal choice) and differentiation (i.e., vaccine-specific attitudes and beliefs as opposed to attitudes and beliefs about vaccination in general) (Velan et al, 2012).

The relationship between education and vaccine hesitancy appears to be more complex (Larson et al., 2014). Findings revealed a significant negative relationship between educational attainment and concern about vaccine safety; however, educational attainment

was not directly associated with reported receipt of the seasonal influenza vaccine. Instead, educational attainment acted as a significant moderator of the relationship between concern with vaccine safety (i.e., negative vaccine beliefs) and reported receipt of the seasonal influenza vaccine. This finding suggests that of individuals exhibiting greater concern with the safety of vaccines *in general* (not the safety of the seasonal influenza vaccine specifically), those with higher educational attainment may be less likely to receive the seasonal influenza vaccine compared to those with lower educational attainment. The relationship between attitudinal and behavioural outcomes of vaccine hesitancy is therefore important to consider when promoting vaccination (Velan et al., 2012).

This finding can be interpreted based on a dual-map of vaccine hesitancy recently proposed by Peretti-Watel et al. (2015), which suggests that individuals can exhibit either ‘rationalised’ or ‘passive’ forms of vaccine hesitancy. The authors suggest that rationalized vaccine hesitancy is displayed more frequently among individuals with higher educational attainment (Peretti-Watel et al., 2014), which might relate to their heightened endorsement of ‘healthism’ (Greenhalgh & Wesseley, 2004). Specifically, individuals who endorse a lifestyle guided by healthism are actively committed to health-related issues and seek to exert control over their health by making autonomous decisions, and are in turn more likely to question mainstream health authorities (Greenhalgh & Wesseley, 2004; Peretti-Watel et al., 2015). Those who endorse a lifestyle guided by healthism are characterized as university-educated, middle class individuals that are prone to information seeking and balanced decision-making (Greenhalgh & Wesseley, 2004; Peretti-Watel et al., 2015). Future research should further investigate differences in vaccine hesitancy based on educational attainment and whether they relate to aspects such as the endorsement of healthism and information seeking behaviours.

Finally, qualitative findings provide insight on attitudes and beliefs of university-educated adults regarding the seasonal influenza vaccine specifically. A group of university-educated adults mentioned numerous factors related to contextual, vaccine-specific, and individual determinants of vaccine hesitancy that were considered important drivers of vaccine decision-making and behaviour. Advances within the Canadian public health system paradoxically fostered a sense of security resulting in low perceived risk (e.g., likelihood) associated with contracting the seasonal influenza virus, yet also raised questions about the necessity of mass seasonal influenza vaccination programs in Canada.

Participants also emphasized the importance of informed decision-making, and expressed uncertainty with respect to vaccine-specific issues, including the perceived safety of the seasonal influenza vaccine. The relationship between information deficit and information seeking behaviours, and how this relationship might differ for individuals with higher versus lower educational attainment, should be investigated in future studies. Interestingly, a perceived lack of information fostered inaction among some participants (i.e., omission bias, Ritov & Baron, 1990), suggesting that individuals may not be sufficiently convinced about the benefits of seasonal influenza immunization to receive the vaccine. Participants' emphasis on individual determinants (e.g., personal interests) and their discontent with health authorities' uniform style of communicating about health and vaccine-related issues, which participants' felt does not recognize the diverse needs of subpopulations, suggests that knowledge translation initiatives should be tailored to various subgroups of the population, addressing specific concerns expressed by hesitant individuals. Additional qualitative investigations on public perceptions of vaccination are necessary to ensure effective communication between experts and the public, since 'understanding the perspectives of the people for whom immunization services are intended, and their

engagement with the issue, is as important as the information that experts want to communicate' (Goldstein et al., 2015).

Tailored Intervention Strategies

Findings from the present thesis support the notion that intervention strategies designed to promote vaccine acceptance should be tailored to specific subgroups of the population that are hesitant towards vaccination (WHO, 2013; Smith, Appleton, & MacDonald, 2013; Nowak et al., 2015). For example, the guide for Tailored Immunization Programs (TIP) designed by the WHO Regional Office for Europe (WHO, 2013) provides tools to design evidence-informed responses to vaccine hesitancy based on the identification of subgroups of the population and of salient factors that act as either promoters or barriers to vaccination among these individuals. Importantly, while initial findings from this thesis suggest that certain subgroups of the population (e.g., individuals with lower educational attainment) demonstrate stronger endorsement of negative vaccine beliefs, the latter may not in fact result in heightened vaccine refusal among these individuals. Instead, subsequent findings indicate that the relative strength of influence of factors associated with vaccine hesitancy (e.g., concern with vaccine safety) on vaccine behaviours (i.e., vaccine receipt) is based on interrelationships between salient factors and determinants of vaccine hesitancy, such as educational attainment (Larson et al., 2014; WHO, 2014b).

In line with the findings presented in this thesis, reports suggest that intervention strategies that take into account the interrelationships between various determinants of vaccine hesitancy, including factors at the intrapersonal and interpersonal levels (i.e., individual/group influences, WHO, 2014b), and institutional and policy levels (i.e. contextual influences, WHO, 2014b) may be more successful at promoting vaccine acceptance compared to strategies that only target factors at the individual level (Kumar et

al., 2012). Importantly, ‘inconvenient access, limited availability of vaccination services, an inadequately trained vaccination providers all have the potential to create or increase hesitancy’ (Nowak et al., 2015, p. 4210). Nevertheless, individual influences (e.g., knowledge, attitudes and beliefs, perceived risk) remain the most salient determinants informing vaccine decision-making and uptake (Kumar et al., 2012; Boerner et al., 2013; Chen, 2015). For example, in developed countries such as Canada, vaccine hesitancy is often present despite the availability of vaccination services (WHO, 2014b).

Public health officials have largely addressed vaccine hesitancy with promotional brochures and public education initiatives that aim to provide evidence-based knowledge to counteract anti-vaccine rhetoric (Evans et al., 1997). Although the effectiveness of fact-based initiatives has been questioned (Smith, Appleton, & MacDonald, 2013), the scientific community responsible for developing and implementing vaccines is required to provide evidence-based information to members of the public in order to foster informed decision-making (Bostrom, 1997).

According to a recent global review, strategies that are designed to address vaccine hesitancy are limited and lack adequate evaluative evidence assessing their impact on vaccine acceptance (Jarrett et al., 2015). Findings in the present study indicate a persistent uncertainty with respect to ‘common vaccine misconceptions’ addressed in informational brochures by the CDC (*6 Common Misconceptions about Vaccines: And How to Respond to Them*; CDC, 1995) and Immunize Canada (*Immunization: Get the Facts*; Immunize Canada, 2013), specifically regarding the purported link between the MMR vaccine and the development of autism and the notion that a single inoculation for multiple diseases can result in more serious adverse events. Public uncertainty about these claims indicates that expert communication about empirical evidence that disputes these claims has not been

effectively translated to members of the general population. It is therefore crucial that fact-based approaches, such as informational brochures and public health advertisements, be evaluated in order to determine their relative impact on vaccine decision-making and behaviour across members of the general public (Bostrom, 1997; Jarrett et al., 2015; Nowak et al., 2015).

Evidence supporting the importance of healthcare professional recommendations in promoting vaccine acceptance has resulted in a focus on developing ‘dialogue-based interventions’ to address vaccine hesitancy at the individual level, with the aim of improving knowledge exchange between healthcare professionals and vaccine hesitant individuals (Healy & Pickering, 2011; MacDonald & Finlay, 2013; Jarrett et al., 2015). These strategies stem from findings suggesting that positive interactions between patients and healthcare professionals are crucial in maintaining public acceptance of vaccination (Benin et al., 2006; Boerner et al., 2013; Dubé et al., 2013; Yaqub et al., 2014). Qualitative findings from the present thesis revealed that while some participants who reported not receiving the influenza vaccine annually felt pressured by their physician’s recommendations to be immunized, participants who reported receiving the vaccine annually perceived their physician recommendations as positive reminders. Strategies for effective communication of vaccine-related information by healthcare professionals have focused on actively engaging hesitant individuals in the decision-making process and openly discussing concerns specific to each individual in a non-judgemental manner, which goes beyond simply providing fact-based information in support of vaccination (Wilson et al., 2005; Larson, Paterson, & Erond, 2012; Leask et al., 2012; MacDonald & Finlay, 2013).

Chen (2015) suggests that effective communication between health authorities and the public requires the former to better understand the core values that influence public

perceptions of vaccination and to determine whether their own values diverge from public desires. Chen (2015) also argues that a participatory approach (Bombard et al., 2011) would allow health authorities to determine value similarities between them and the public, which would be integrated in public health messaging to foster social trust (Siegest, Cvetkovich, & Roth, 2000) and subsequently promote vaccine acceptance and uptake. Notably, findings support evidence indicating that trusting relationships between patients and healthcare professionals are centered on whether physicians are perceived as both caring and competent when communicating with individuals about vaccination (Benin et al., 2006; MacDonald & Finlay, 2013; Larson et al., 2015). Importantly, Evans et al. (1997, p. 21) emphasize that ‘good risk communication recognizes a diversity of form and context needs in the general population’. It therefore remains important that the messages conveyed by health authorities be framed not only in a way that reflects salient values, but also that takes into account the relevant determinants of vaccine hesitancy, which encompass contextual and individual influences as well as vaccine-specific issues (WHO, 2014b; Dubé, Vivion, & MacDonald, 2015).

The importance of message framing in risk communication has previously been articulated. Notably, Evans et al. (1997, p. 8) indicate that ‘the way in which information is presented or the context into which it is placed affects how risk communication messages are received’. For example, a meta-analysis by Keller & Lehmann (2008) found that messages alluding to social consequences were more influential among younger audiences, whereas older audiences were influenced more by messages pertaining to physical consequences. Amongst other recommendations, Nowak et al. (2015) indicate that campaigns, messages, and materials should be guided by, and tailored to, targeted populations or individuals. Furthermore, these authors articulate the need for additional research on ‘how members of

targeted populations perceive vaccines and vaccination recommendations, and what factors could potentially facilitate acceptance’ (Nowak et al., 2015, p. 4210).

A recent review by the SAGE Working Group on Vaccine Hesitancy (Nowak et al., 2015) examined how social and commercial marketing principles and practices can be used to address vaccine hesitancy. Social marketing ‘seeks/encourages an enhanced understanding of how different subgroups in the targeted population are likely to be persuaded given that hesitancy varies and is not uniform across the population’ (Nowak et al., 2015, p. 4205-06). Social marketing principles and practices seek to utilize findings on barriers and promoters of vaccination and their determinants in order to effectively communicate information that promote positive attitudes and behaviours towards immunization across subgroups of the population (Andreasen, 1995; Larson et al., 2011; Nowak et al., 2015). Findings from the present study suggest that communication about vaccine information should consider socio-demographic characteristics of the target population, including age and educational attainment, which is consistent with research on compliance with healthcare recommendations (Keller & Lehmann, 2008).

Study Limitations

The quantitative findings of the present thesis project provide a unique account of vaccine attitudes and beliefs expressed by members of the Canadian general population and of the interrelationships between socio-demographic characteristics, dimensions of vaccine hesitancy, and reported vaccine receipt. Moreover, quantitative results were derived from a random subset of a large, national sample of Canadians, representative of the general population in terms of gender, age, and region based on data from the 2011 Canadian Census. Results from the survey provide a national perspective on public agreement with

numerous vaccine-related beliefs. The survey findings also highlight important differences based on respondents' socio-demographic characteristics, including age and educational attainment. The latter differences provide important insight on the heterogeneity of vaccine attitudes and beliefs across subgroups of the population.

Notwithstanding the strengths of the quantitative findings, several methodological limitations must be acknowledged. Firstly, the cross-section nature of the national survey, and potential responses biases due to the use of a Probit™ panel of respondents, and low response rates, must be acknowledged as potential limitations of the present findings. Secondly, in order to keep the survey a reasonable length, the quantitative data presented in the first and second manuscripts was derived from responses to 23 vaccine-related statements that represented one of three subsections of a national health risk perception survey administered to adults across Canada. Each of the three subsections of the survey was completed by a random subsample of the total number of survey respondents. Specifically, after completing the 'core' sections of the survey, respondents were randomly assigned to one of three subsections addressing the following topics: vaccines, radiation, and emergency preparedness. Therefore, the responses analyzed in the present study were obtained from a subset of the total sample of survey respondents, stratified according to gender, age, and region based on data from the 2011 Canadian Census.

It should also be noted that despite the stratified sampling procedure, the overall sample of survey respondents is likely to have had a relatively higher level of education and income than the general population. According to data from the 2011 Canadian Census, 64.1% of adults aged 25 to 64 had postsecondary qualifications, which includes adults with trade certificates, college diplomas, university certificates below bachelor level and university degrees (Statistics Canada, 2011). It is important to note that respondents of the

2012 national health risk perception survey included adults aged 18 and over (including adults aged 65+), and educational attainment was based on the indication of ‘some or completed’ high school, college (CEGEP in Quebec), university, or graduate degrees. As a result, 82.3% of respondents in the survey sample had at least *some or completed* high school, college, university (bachelor’s), or graduate level education. Although this percentage is likely higher than what is reflected in the general population of Canada, it is important to note that Canadian census data does not include adults < 25 years old and > 64 years old, and does not consider the acquisition of ‘some’ (i.e., incomplete) educational experience that did not result in a completed degree.

Thirdly, the vaccine-related survey statements were developed based on constructs of health risk perception included in previous health risk perception surveys (Krewski et al., 1995ab; 2006; 2008; 2009; 2012), rather than factors outlined in the literature on vaccine hesitancy specifically. Also, in the interest of comparing responses to statements across all three subsections of the survey, several vaccine-related statements were formulated to match the wording of statements pertaining to radiation and emergency preparedness. In this respect, the design of vaccine-related survey statements potentially limits how it relates to concepts associated with vaccine hesitancy discussed in the literature.

Fourthly, the uneven distribution of levels of ‘disagreement’ vs. ‘agreement’ depicted in the 5-point Likert scale used to measure respondents’ level of agreement with vaccine-related statements limits the interpretability of responses (do not agree at all vs. agree a little bit to agree completely). Specifically, the Likert scale employed used primarily ‘agree’-based response choices, it also was not possible to dichotomize levels of agreement to indicate whether respondents either agreed or disagreed with the survey statements. In addition, ‘don’t know/no opinion’ responses were not included in the analyses since survey

statements were treated as continuous variables and the latter response category was external to the Likert scale of agreement (i.e., Likert scale ranging from 1 (do not agree at all) to 5 (agree completely)). Also, response biases based on the sampling procedures (i.e., the use of a Probit™ sample of preselected participants) and low response rates represent a potential limitation of the survey results.

Finally, the outcome variable used to assess reported receipt of the seasonal influenza vaccine (i.e., ‘I usually get the seasonal flu vaccine’) limits the interpretation of findings on predictors of reported receipt of the seasonal influenza vaccine. Specifically, findings are limited to a generalized form of reported past vaccine receipt, as opposed to a more specific indication of vaccine receipt (e.g., ‘I received the seasonal flu vaccine last year’) or future intent (e.g., ‘I intend on receiving the seasonal flu vaccine this year’) as measured in other studies (Kumar et al., 2012; Chen, 2015). Additional research is therefore required to confirm these findings and to examine whether the predictors of reported vaccine receipt identified in this study also apply to intended vaccination behaviours, specific past vaccination behaviour, and to the reported receipt of vaccines other than the seasonal influenza inoculation.

The qualitative findings presented in this thesis provide valuable insight on perceptions of seasonal influenza immunization among educated adults and identified salient factors related to contextual, vaccine-specific, and individual determinants of vaccine hesitancy that can inform subsequent studies on adult immunization for seasonal influenza in Canada. Methodological limitations of the qualitative investigation primarily relate to the sampling procedure and sample size, which limit the interpretation of findings as pertaining specifically to educated adults residing in an urban area of Ottawa, Ontario. Although the size and homogeneity of the sample limits the transferability of the results to the general

adult Canadian population, findings support previous research and provide valuable insight on factors that are considered important drivers of vaccine decision-making among members of the Canadian general public.

Conclusion

In conclusion, the findings presented in this thesis provide unique insight on the phenomenon of vaccine hesitancy in Canada. To our knowledge, only one previous study provided national data on vaccine attitudes and beliefs from a sample of Canadian adults (Ritvo et al., 2003). No other studies have investigated the interrelationships between components of vaccine hesitancy and reported vaccination behaviour across subgroups of the Canadian population. Together, findings provide a valuable contribution to the literature on vaccine hesitancy and a better understanding of this phenomenon within a Canadian context. Findings from the first and second studies emphasize the importance of assessing varying vaccine attitudes and beliefs across subgroups the population, and to determine the extent to which these attitudes are associated with vaccination behaviours. Qualitative findings provide insight on the salient factors associated specifically with adult immunization for seasonal influenza, which can inform more representative studies investigating influenza immunization among healthy adults in Canada.

The Canadian government's investment in a national strategy to increase vaccination rates (Liberal Party of Canada, 2015) is a step in the right direction in addressing vaccine hesitancy in Canada. Importantly, it is essential that this strategy incorporate methods for audience segmentation and a clear understanding of how vaccine hesitancy can result in varying attitudinal and behavioral outcomes across subgroups of the population.

Challenges in addressing vaccine hesitancy in Canada are related to the varying degrees of hesitancy both within and across subpopulations, resulting from interrelationships among multiple factors (e.g., confidence, complacency, and convenience) and determinants (contextual, individual, and vaccine-specific) (WHO, 2014b, Larson et al., 2014). Findings from this thesis indicate that intervention strategies should be tailored to the concerns of hesitant subpopulations, particularly those that may be more likely to refuse vaccination (e.g., hesitant educated individuals that are likely to be more skeptical of the uniform recommendations provided by mainstream health authorities). For example, educated adults may demonstrate a greater need for ‘sufficient information’ on a vaccine and the disease it prevents in order to ensure informed decision-making (Yang, 2012), which may relate to a stronger commitment to the understanding of health- and vaccine-related issues (i.e., ‘healthism’, Greenhalgh & Wesseley, 2004). In contrast, hesitant individuals with lower educational attainment who are not as committed to vaccine-related issues may be more likely to rely on healthcare professional recommendations to inform their decision-making (Peretti-Watel et al., 2015). A better understanding of the information required by hesitant individuals to feel sufficiently informed in their vaccine decision-making and how best to convey this information (e.g., message framing) is needed to foster effective communication between experts and the public.

Audience segmentation techniques should be utilized to improve mass communication strategies by government health authorities and ensure positive patient-physician interactions that promote vaccine acceptance. Future studies should evaluate the impact of social marketing principles (Nowak et al., 2015) and the utilization of new technologies, such as the Internet and social media (Wilson, Atkinson, & Deeks, 2014), on vaccine acceptance across various subgroups of the population.

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Appendix A: National Health Risk Perception Survey Materials

Survey Instrument (selected sections) – English

PHONE INTRO

Good morning/afternoon/evening. My name is ____ I'm calling from EKOS Research Associates. We have been hired by Dr Lemyre and the Institute of Population Health at the University of Ottawa to conduct a survey on various health risks facing Canadians. It will likely take about 20 to 25 minutes and will help with the scientific understanding of how Canadians perceive health risks and what seems acceptable or unacceptable to them.

Your participation is anonymous. While results of the study will be published, no one individual's responses to the questions will be shared. All data will be tabulated and maintained by the researchers in accordance with research ethics confidentiality standards.

The questions are general and you do not have to reveal any information you do not want to. There are no right or wrong answers. We only want your opinion.

As with all other survey conducted through Probit, as a token of our appreciation Probit will enter you into our monthly draw for \$1000 and you will earn \$2 charity dollars.

Do I have your consent to continue with this telephone interview? Or do you prefer we call you back later?

WEB INTRO

EKOS Research Associates have been hired by Dr. Lemyre and the Institute of Population Health at the University of Ottawa to conduct a survey on various health risks facing Canadians. It will likely take about 20 to 25 minutes and will help with the scientific understanding of how Canadians perceive health risks and what seems acceptable or unacceptable to them.

Your participation is anonymous. While results of the study will be published, no one individual's responses to the questions will be shared. All data will be tabulated and maintained by the researchers in accordance with research ethics confidentiality standards.

The questions are general and you do not have to reveal any information you do not want to. There are no right or wrong answers. We only want your opinion.

As with all other survey conducted through Probit, as a token of our appreciation Probit will enter you into our monthly draw for \$1000 and you will earn \$2 charity dollars.

A few reminders before beginning ...

On each screen, after selecting your answer, click on the "Continue" button at the bottom of the screen to move forward in the questionnaire.

If you leave the survey before completing it, you can return to the survey URL later, and you will be returned to the page where you left off. Your answers up to that point in the survey will be saved.

If you have any questions about how to complete the survey, please call Probit at 866.211.8881 or send an email to online@probit.ca.

Thank you in advance for your participation.

ISEX

< ONLINE : Are you .../ PHONE : Record gender of respondent (DO NOT ASK) >

Male 1
Female 2

ILANG

PHONE

Language of Survey

[observe DO NOT READ]

English 1
French 2

Q3

Under 18, Screened-out

< Before we begin, I have one question to ask you for classification purposes only. In which of the following age categories do you belong?/In which of the following age categories do you belong?>

< READ LIST >

Under 18	1	->THNK2
18-24	2	
25-34	3	
35-44	4	
45-54	5	
55-64	6	
65 or older.....	7	
< Refused to answer (Do Not Read)/Would prefer not to say >	99	B

.....

PREQ10C

1/3 Sample

If... ROTQB = 3

< In the next section, I am going to read you a list of statements about vaccines. I am going to ask how much you agree with each statement. Tell me how much it reflects your own personal opinion. We are going to use the same 5-point agreement scale / In the next section is a list of statements about vaccines. We would like to know how much you agree with each statement. Tell us how much it reflects your own personal opinion. >

Q10CA

If... ROTQB = 3

Science and technology help to ensure that vaccines are safe.

Do not agree at all (1)	1
Agree a little bit (2)	2
Agree somewhat (3)	3
Agree quite a bit (4).....	4
Agree completely (5).....	5
Don't know /no opinion	99

Q10CB

If... ROTQB = 3

I discuss with others the information I get on vaccines.

Do not agree at all (1).....	1
Agree a little bit (2).....	2
Agree somewhat (3).....	3
Agree quite a bit (4).....	4
Agree completely (5).....	5
Don't know /no opinion	99

Q10CC

If... ROTQB = 3

I usually get the seasonal flu vaccine.

Do not agree at all (1).....	1
Agree a little bit (2).....	2
Agree somewhat (3).....	3
Agree quite a bit (4).....	4
Agree completely (5).....	5
Don't know /no opinion	99

Q10CD

If... ROTQB = 3

Even if I didn't understand why, I would likely follow the advice from government authorities to get the recommended vaccine.

Do not agree at all (1).....	1
Agree a little bit (2).....	2
Agree somewhat (3).....	3
Agree quite a bit (4).....	4
Agree completely (5).....	5
Don't know /no opinion	99

Q10CE

If... ROTQB = 3

It is the government's responsibility to ensure the availability of vaccines for Canadians.

Do not agree at all (1).....	1
Agree a little bit (2).....	2
Agree somewhat (3).....	3
Agree quite a bit (4).....	4
Agree completely (5).....	5
Don't know /no opinion	99

Q10CF

If... ROTQB = 3

I am responsible for making the decision to get vaccinated.

- Do not agree at all (1) 1
- Agree a little bit (2) 2
- Agree somewhat (3) 3
- Agree quite a bit (4) 4
- Agree completely (5) 5
- Don't know /no opinion 99

Q10CG

If... ROTQB = 3

Vaccination only benefits people who have been vaccinated.

- Do not agree at all (1) 1
- Agree a little bit (2) 2
- Agree somewhat (3) 3
- Agree quite a bit (4) 4
- Agree completely (5) 5
- Don't know /no opinion 99

Q10CH

If... ROTQB = 3

A vaccine that protects against several diseases is more likely to cause serious side effects.

- Do not agree at all (1) 1
- Agree a little bit (2) 2
- Agree somewhat (3) 3
- Agree quite a bit (4) 4
- Agree completely (5) 5
- Don't know /no opinion 99

Q10CI

If... ROTQB = 3

Vaccines weaken the immune system.

Do not agree at all (1).....	1
Agree a little bit (2).....	2
Agree somewhat (3).....	3
Agree quite a bit (4).....	4
Agree completely (5).....	5
Don't know /no opinion	99

Q10CJ

If... ROTQB = 3

When the people I like worry about vaccines I am more likely to worry as well.

Do not agree at all (1).....	1
Agree a little bit (2).....	2
Agree somewhat (3).....	3
Agree quite a bit (4).....	4
Agree completely (5).....	5
Don't know /no opinion	99

Q10CK

If... ROTQB = 3

Getting sick from a disease is more acceptable to me than getting sick from a vaccine.

Do not agree at all (1).....	1
Agree a little bit (2).....	2
Agree somewhat (3).....	3
Agree quite a bit (4).....	4
Agree completely (5).....	5
Don't know /no opinion	99

Q10CL

If... ROTQB = 3

The benefits of vaccines outweigh the risks.

Do not agree at all (1).....	1
Agree a little bit (2).....	2
Agree somewhat (3).....	3
Agree quite a bit (4).....	4
Agree completely (5).....	5
Don't know /no opinion	99

Q10CM

If... ROTQB = 3

Information about vaccines is confusing.

- Do not agree at all (1) 1
- Agree a little bit (2) 2
- Agree somewhat (3) 3
- Agree quite a bit (4) 4
- Agree completely (5) 5
- Don't know /no opinion 99

Q10CN

If... ROTQB = 3

It is difficult to predict the long term effects of vaccines.

- Do not agree at all (1) 1
- Agree a little bit (2) 2
- Agree somewhat (3) 3
- Agree quite a bit (4) 4
- Agree completely (5) 5
- Don't know /no opinion 99

Q10CO

If... ROTQB = 3

Scientists usually agree about the risks associated with vaccines.

- Do not agree at all (1) 1
- Agree a little bit (2) 2
- Agree somewhat (3) 3
- Agree quite a bit (4) 4
- Agree completely (5) 5
- Don't know /no opinion 99

Q10CP

If... ROTQB = 3

Vaccines provide complete and long-term immunization against diseases.

Do not agree at all (1).....	1
Agree a little bit (2).....	2
Agree somewhat (3).....	3
Agree quite a bit (4).....	4
Agree completely (5).....	5
Don't know /no opinion	99

Q10CQ

If... ROTQB = 3

Vaccines are not necessary because diseases cure themselves naturally.

Do not agree at all (1).....	1
Agree a little bit (2).....	2
Agree somewhat (3).....	3
Agree quite a bit (4).....	4
Agree completely (5).....	5
Don't know /no opinion	99

Q10CR

If... ROTQB = 3

Diseases that can be prevented by vaccines have been virtually eliminated in Canada.

Do not agree at all (1).....	1
Agree a little bit (2).....	2
Agree somewhat (3).....	3
Agree quite a bit (4).....	4
Agree completely (5).....	5
Don't know /no opinion	99

Q10CS

If... ROTQB = 3

It is unlikely that I will experience serious side effects from a vaccine.

Do not agree at all (1).....	1
Agree a little bit (2).....	2
Agree somewhat (3).....	3
Agree quite a bit (4).....	4
Agree completely (5).....	5
Don't know /no opinion	99

Q10CT

If... ROTQB = 3

Organizations such as workplaces and schools should facilitate vaccination campaigns

- Do not agree at all (1) 1
- Agree a little bit (2) 2
- Agree somewhat (3) 3
- Agree quite a bit (4) 4
- Agree completely (5) 5
- Don't know /no opinion 99

Q10CU

If... ROTQB = 3

I am concerned about the safety of vaccines.

- Do not agree at all (1) 1
- Agree a little bit (2) 2
- Agree somewhat (3) 3
- Agree quite a bit (4) 4
- Agree completely (5) 5
- Don't know /no opinion 99

Q10CV

If... ROTQB = 3

Vaccines can cause many harmful side effects, illnesses, and even death.

- Do not agree at all (1) 1
- Agree a little bit (2) 2
- Agree somewhat (3) 3
- Agree quite a bit (4) 4
- Agree completely (5) 5
- Don't know /no opinion 99

Q10CW

If... ROTQB = 3

The Measles-Mumps-Rubella vaccine can cause autism.

Do not agree at all (1).....	1
Agree a little bit (2).....	2
Agree somewhat (3).....	3
Agree quite a bit (4).....	4
Agree completely (5).....	5
Don't know /no opinion	99

Q10

< Now in order to categorize the responses, I need some general information about you. I will treat all of the following information as confidential. In which education category do you belong? / Now in order to categorize the responses, we will need some general information about you. All of the following information is confidential. In which education category do you belong?>

Some/completed elementary school.....	1
Some/completed high school.....	2
Some/completed community college (CEGEP in Quebec).....	3
Some/completed university	4
Some/completed graduate school.....	5
Would prefer not to say.....	99

Q11

In general, would you say your health is:

Excellent.....	1
Very good.....	2
Good.....	3
Fair.....	4
Poor.....	5
Don't know/no opinion	99
Would prefer not to say.....	98

Q12

In which of the following classifications does your total household income fall before taxes?

Less than \$50,000.....	1
\$50,000 to less than \$60,000.....	2
\$60,000 to less than \$80,000.....	3
\$80,000 to less than \$100,000.....	4
\$100,000 to less than \$150,000.....	5
\$150,000 to less than \$200,000.....	6
\$200,000 or more.....	7
Don't know/no opinion	99
Would prefer not to say.....	98

Q13

Is your residence located in a rural or urban area?

- Urban 1
- Rural 2
- Would prefer not to say 3

Q14

Are you a parent?

- Yes 1
- No 2
- Would prefer not to say 9

Q15

YES, Q14

If... Q14 = 1

What is the age of your youngest child?

- Record age in years: 1
- Would prefer not to say 99

Q16

Were you born in Canada?

- Yes 1
- No 2
- Would prefer not to say 9

Q17

NO, Q16

If... Q16 = 2

What year did you first come to live in Canada?

- Year 1
- Would prefer not to say 9

.....
.....

Q19

What language do you speak most often at home?

English.....	1
French.....	2
Other Please specify:.....	97
Would prefer not to say.....	99

.....

.....

.....

Q23

Could you please provide your postal code?

1.....	1
--------	---

FDBK

ONLINE

If... SAMPL = 1

Please provide any other comments that would assist us with this study:

1.....	1
--------	---

FUTRSTDS

The research team directed by Dr. Louise Lemyre at the Institute of Population Health, University of Ottawa, conduct various studies on understanding risk perception and health.

Would you be willing to be contacted and provided with more information on how you might participate in these other studies?

Yes.....	1
No.....	2

INFO1

Yes, FUTRSTDS

If... FUTRSTDS = 1

Could we provide your contact information to Dr. Louise Lemyre? This information will be separated and stored separately from your responses to this survey. Your survey responses will remain anonymous.

- Yes..... 1
- No..... 2

THNK

Thank you very much for taking the time to complete this survey.

THNK2

Screened-out

Thank you for your cooperation! Unfortunately based on the information you have provided, you are not eligible to complete the remainder of this survey.

Survey Instrument (selected sections) – French

PHONE INTRO

Bon matin/après-midi/soir. Je m'appelle _____ et je vous appelle de EKOS, une compagnie de sondage, de la part de Dre Louise Lemyre de l'Institut de recherche sur la santé des populations de l'Université d'Ottawa. Nous menons une enquête au sujet de risques pour la santé auxquels font face les Canadiens. L'entrevue téléphonique prendra environ 25 à 30 minutes. Le sondage nous aidera à déterminer comment les Canadiens perçoivent les risques de santé et ce qui leur semble acceptable ou non.

Votre participation est anonyme. Quoique les résultats de l'étude seront publiés et discutés à des conférences de recherche, ils n'incluront aucune réponse individuelle. Toutes les données seront tabulées et maintenues par les chercheur-es en accord avec les normes de confidentialité de la recherche universitaire.

Les questions sont générales et vous n'êtes aucunement obligé de divulguer les informations que vous ne voulez pas. Il n'y a ni de bonnes ni de mauvaises réponses. Nous voulons simplement vos opinions.

Comme pour tous les sondages Probit, en guise de remerciement pour avoir répondu au sondage, votre nom sera inscrit à notre tirage au sort mensuel de 1000 \$ et vous obtiendrez 2 \$ sous forme de don de charité.

Ai-je votre consentement pour continuer avec l'entrevue téléphonique maintenant? Ou préférez-vous être rappelé-e à un autre moment?

Puis-je commencer?

WEB INTRO

La firme de recherche EKOS a été engagé par Dr Louise Lemyre de l'Institut de santé des populations à l'Université d'Ottawa afin de mener un sondage sur les divers risques envers la santé auxquels font face les Canadiens. . Le questionnaire devrait vous prendre environ 20 à 25 minutes et contribuera à la compréhension scientifique de comment les Canadiens perçoivent les risques et ce qui leur semble acceptable ou non en matière de risques.

Votre participation est anonyme. Quoique les résultats de l'étude seront publiés et discutés à des conférences de recherche, ils n'incluront aucune réponse individuelle. Toutes les données seront tabulées et maintenues par les chercheur-es en accord avec les normes de confidentialité de la recherche universitaire.

Les questions sont générales et vous n'êtes aucunement obligé de divulguer les informations que vous ne voulez pas. Il n'y a ni de bonnes ni de mauvaises réponses. Nous voulons simplement votre opinion.

Comme pour tous les sondages Probit, en guise de remerciement pour avoir répondu au sondage votre nom sera inscrit à notre tirage au sort mensuel de 1000 \$ et vous obtiendrez 2 \$ sous forme de don de charité.

Aide-mémoire avant de débiter...

Sur chaque page, après avoir sélectionné votre réponse, cliquez sur le bouton « Continuer » au bas de l'écran pour pouvoir procéder à la question suivante.

Si vous quittez le sondage avant de l'avoir terminé, vous pourrez y revenir au moyen de l'adresse URL et vous obtiendrez alors la page où vous étiez en quittant. Les réponses que vous aurez données jusque-là auront été sauvegardées.

Pour toute question sur la façon de remplir le sondage, veuillez téléphoner à Probit au 866.211.8881 ou envoyer un courriel à l'adresse suivante : online@probit.ca.

Merci à l'avance de votre participation.

ISEX

< ONLINE : Êtes-vous ... / PHONE : Inscrire le sexe du répondant >

Un homme 1
Une femme 2

ILANG

PHONE

Langue du sondage

[observer - NE PAS LIRE]

Anglais 1
Français 2

Q3

Under 18, Screened-out

< Avant que nous débutions, j'ai une question à vous poser pour fin de classification seulement. À quelle catégorie d'âge appartenez-vous?/ À laquelle des tranches d'âge suivantes appartenez-vous?>

< LIRE LA LISTE>

Moins de 18 ans.....	1	->THNK2
18-24 ans	2	
25-34 ans	3	
35-44 ans	4	
45-54 ans	5	
55-64 ans	6	
65 ou plus	7	
< Refus de fournir une réponse (Ne pas lire) / Préfère ne pas répondre>	99	B

PREQ10C

1/3 Sample

If... ROTQB = 3

< Dans la prochaine section, je vais vous lire une série d'énoncés sur les vaccins. Je vais vous demander jusqu'à quel point vous êtes d'accord avec chacun de ces énoncés. Dites-moi dans quelle mesure ils reflètent votre opinion personnelle. Nous utiliserons la même échelle de cinq points. / Cette section contient des énoncés sur les vaccins. Nous aimerions savoir à quel point vous êtes d'accord avec chacun de ces énoncés. Dites-nous dans quelle mesure ils reflètent votre opinion personnelle.>

Q10CA

If... ROTQB = 3

Les sciences et technologies aident à assurer que les vaccins soient sécuritaires.

Pas du tout d'accord (1).....	1
Un peu d'accord (2).....	2
Assez d'accord (3).....	3
Plutôt d'accord (4).....	4
Tout à fait d'accord (5).....	5
Ne sait pas/ Pas d'opinion	99

Q10CB

If... ROTQB = 3

Je discute avec d'autres personnes des renseignements que j'obtiens sur les vaccins.

Pas du tout d'accord (1).....	1
Un peu d'accord (2).....	2
Assez d'accord (3).....	3
Plutôt d'accord (4).....	4
Tout à fait d'accord (5).....	5
Ne sait pas/ Pas d'opinion	99

Q10CC

If... ROTQB = 3

Je reçois généralement le vaccin contre la grippe saisonnière.

Pas du tout d'accord (1).....	1
Un peu d'accord (2).....	2
Assez d'accord (3).....	3
Plutôt d'accord (4).....	4
Tout à fait d'accord (5).....	5
Ne sait pas/ Pas d'opinion	99

Q10CD

If... ROTQB = 3

Même si je ne comprenais pas pourquoi, je suivrais probablement les recommandations des autorités gouvernementales en ce qui a trait à l'obtention des vaccins recommandés.

Pas du tout d'accord (1).....	1
Un peu d'accord (2).....	2
Assez d'accord (3).....	3
Plutôt d'accord (4).....	4
Tout à fait d'accord (5).....	5
Ne sait pas/ Pas d'opinion	99

Q10CE

If... ROTQB = 3

Il est de la responsabilité du gouvernement de s'assurer de la disponibilité des vaccins pour les Canadiens.

Pas du tout d'accord (1).....	1
Un peu d'accord (2).....	2
Assez d'accord (3).....	3
Plutôt d'accord (4).....	4
Tout à fait d'accord (5).....	5
Ne sait pas/ Pas d'opinion	99

Q10CF

If... ROTQB = 3

Je suis responsable de prendre la décision de me faire vacciner.

Pas du tout d'accord (1).....	1
Un peu d'accord (2).....	2
Assez d'accord (3).....	3
Plutôt d'accord (4).....	4
Tout à fait d'accord (5).....	5
Ne sait pas/ Pas d'opinion	99

Q10CG

If... ROTQB = 3

La vaccination ne profite qu'aux gens qui ont été vaccinés.	
Pas du tout d'accord (1).....	1
Un peu d'accord (2).....	2
Assez d'accord (3).....	3
Plutôt d'accord (4).....	4
Tout à fait d'accord (5).....	5
Ne sait pas/ Pas d'opinion	99

Q10CH

If... ROTQB = 3

Un vaccin qui protège contre plusieurs maladies est plus susceptible de causer de graves effets secondaires.

Pas du tout d'accord (1).....	1
Un peu d'accord (2).....	2
Assez d'accord (3).....	3
Plutôt d'accord (4).....	4
Tout à fait d'accord (5).....	5
Ne sait pas/ Pas d'opinion	99

Q10CI

If... ROTQB = 3

Les vaccins affaiblissent le système immunitaire	
Pas du tout d'accord (1).....	1
Un peu d'accord (2).....	2
Assez d'accord (3).....	3
Plutôt d'accord (4).....	4
Tout à fait d'accord (5).....	5
Ne sait pas/ Pas d'opinion	99

Q10CJ

If... ROTQB = 3

Lorsque les gens que j'aime s'inquiètent par rapport à un vaccin, il est probable que je m'inquiète moi aussi.

Pas du tout d'accord (1).....	1
Un peu d'accord (2).....	2
Assez d'accord (3).....	3
Plutôt d'accord (4).....	4
Tout à fait d'accord (5).....	5
Ne sait pas/ Pas d'opinion	99

Q10CK

If... ROTQB = 3

Il est plus acceptable de tomber malade à cause d'une maladie qu'en raison d'un vaccin.

Pas du tout d'accord (1).....	1
Un peu d'accord (2).....	2
Assez d'accord (3).....	3
Plutôt d'accord (4).....	4
Tout à fait d'accord (5).....	5
Ne sait pas/ Pas d'opinion	99

Q10CL

If... ROTQB = 3

Les avantages des vaccins ont plus d'importance que les coûts qui y sont associés.

Pas du tout d'accord (1).....	1
Un peu d'accord (2).....	2
Assez d'accord (3).....	3
Plutôt d'accord (4).....	4
Tout à fait d'accord (5).....	5
Ne sait pas/ Pas d'opinion	99

Q10CM

If... ROTQB = 3

L'information sur les vaccins porte à confusion

Pas du tout d'accord (1).....	1
Un peu d'accord (2).....	2
Assez d'accord (3).....	3
Plutôt d'accord (4).....	4
Tout à fait d'accord (5).....	5
Ne sait pas/ Pas d'opinion	99

Q10CN

If... ROTQB = 3

Il est difficile de prédire les effets à long terme des vaccins.

Pas du tout d'accord (1).....	1
Un peu d'accord (2).....	2
Assez d'accord (3).....	3
Plutôt d'accord (4).....	4
Tout à fait d'accord (5).....	5
Ne sait pas/ Pas d'opinion	99

Q10CO

If... ROTQB = 3

Les scientifiques sont généralement d'accord sur les risques associés aux vaccins.

Pas du tout d'accord (1).....	1
Un peu d'accord (2).....	2
Assez d'accord (3).....	3
Plutôt d'accord (4).....	4
Tout à fait d'accord (5).....	5
Ne sait pas/ Pas d'opinion	99

Q10CP

If... ROTQB = 3

Les vaccins fournissent une immunisation complète et à long terme contre les maladies.

Pas du tout d'accord (1).....	1
Un peu d'accord (2).....	2
Assez d'accord (3).....	3
Plutôt d'accord (4).....	4
Tout à fait d'accord (5).....	5
Ne sait pas/ Pas d'opinion	99

Q10CQ

If... ROTQB = 3

Les vaccins ne sont pas nécessaires, car les maladies se guérissent naturellement d'elles-mêmes.

Pas du tout d'accord (1).....	1
Un peu d'accord (2).....	2
Assez d'accord (3).....	3
Plutôt d'accord (4).....	4
Tout à fait d'accord (5).....	5
Ne sait pas/ Pas d'opinion	99

Q10CR

If... ROTQB = 3

Les maladies qui peuvent être prévenues par la vaccination sont presque complètement éliminées au Canada

Pas du tout d'accord (1).....	1
Un peu d'accord (2).....	2
Assez d'accord (3).....	3
Plutôt d'accord (4).....	4
Tout à fait d'accord (5).....	5
Ne sait pas/ Pas d'opinion	99

Q10CS

If... ROTQB = 3

Il est improbable que je ressente des effets secondaires graves d'un vaccin.	
Pas du tout d'accord (1).....	1
Un peu d'accord (2).....	2
Assez d'accord (3).....	3
Plutôt d'accord (4).....	4
Tout à fait d'accord (5).....	5
Ne sait pas/ Pas d'opinion	99

Q10CT

If... ROTQB = 3

Des organisations comme les lieux de travail et les écoles devraient s'occuper des campagnes de vaccination.

Pas du tout d'accord (1).....	1
Un peu d'accord (2).....	2
Assez d'accord (3).....	3
Plutôt d'accord (4).....	4
Tout à fait d'accord (5).....	5
Ne sait pas/ Pas d'opinion	99

Q10CU

If... ROTQB = 3

J'ai des inquiétudes par rapport à la sécurité des vaccins.

Pas du tout d'accord (1).....	1
Un peu d'accord (2).....	2
Assez d'accord (3).....	3
Plutôt d'accord (4).....	4
Tout à fait d'accord (5).....	5
Ne sait pas/ Pas d'opinion	99

Q10CV

If... ROTQB = 3

Les vaccins peuvent causer plusieurs effets secondaires nuisibles, des maladies, et même des décès.

Pas du tout d'accord (1).....	1
Un peu d'accord (2).....	2
Assez d'accord (3).....	3
Plutôt d'accord (4).....	4
Tout à fait d'accord (5).....	5
Ne sait pas/ Pas d'opinion	99

Q10CW

If... ROTQB = 3

Le vaccin contre la rougeole, oreillons et rubéole peut causer l'autisme.	
Pas du tout d'accord (1).....	1
Un peu d'accord (2).....	2
Assez d'accord (3).....	3
Plutôt d'accord (4).....	4
Tout à fait d'accord (5).....	5
Ne sait pas/ Pas d'opinion	99

Q10

< À présent, dans le but de classer les données, j'ai besoin que vous me fournissiez des renseignements généraux sur vous. Tous les renseignements suivants resteront confidentiels. Premièrement, quel niveau de scolarité avez-vous atteint? / Dans le but de classer les données, j'ai besoin que vous me fournissiez des données générales sur vous. Tous les renseignements suivants resteront confidentiels. Quel niveau de scolarité avez-vous atteint?>

École primaire commencée/terminée	1
École secondaire commencée/terminée.....	2
Collège communautaire commencé/terminé (CÉGEP au Québec).....	3
Université commencée/terminée	4
Études supérieures commencées/terminées.....	5
Préfère ne pas répondre	99

Q11

De façon générale, diriez-vous que votre santé est...

excellente?	1
très bonne?.....	2
bonne?.....	3
moyenne?.....	4
mauvaise?	5
Ne sait pas/Pas d'opinion	99
Préfère ne pas répondre	98

Q12

À laquelle des classifications suivantes correspond le revenu total de votre ménage avant impôt?

Moins de 50 000 \$	1
De 50 000 \$ à moins de 60 000 \$	2
De 60 000 \$ à moins de 80 000 \$	3
De 80 000 \$ à moins de 100 000 \$	4
De 100 000 \$ à moins de 150 000 \$	5
De 150 000 \$ à moins de 200 000 \$	6
200 000 \$ ou plus	7
Ne sait pas/Pas d'opinion	99
Préfère ne pas répondre	98

Q13

Votre résidence est-elle située dans une région rurale ou urbaine?

Urbaine	1
Rurale	2
Préfère ne pas répondre	3

Q14

Êtes-vous parent?

Oui	1
Non	2
Préfère ne pas répondre	9

Q15

YES, Q14

If.. Q14 = 1

Quel âge a votre enfant le plus jeune?

Inscrire l'âge en années :	1
Préfère ne pas répondre	99

Q16

Êtes-vous né-e au Canada?

Oui	1
Non	2
Préfère ne pas répondre	9

Q17

NO, Q16

If... Q16 = 2

En quelle année êtes-vous venu habiter pour la première fois au Canada?

Année..... 1
Préfère ne pas répondre 9

.....
.....

Q19

Quelle langue parlez-vous le plus souvent à la maison?

Anglais..... 1
Français..... 2
Autre – Veuillez préciser : 97
Préfère ne pas répondre 99

Q23

Pourriez-vous me donner votre code postal?

1 1

FDBK

ONLINE

If... SAMPL = 1

Veillez nous fournir tout autre commentaire pouvant nous aider dans le cadre de cette étude :

1 1

FUTRSTDS

L'équipe de recherche dirigée par Dre Louise Lemyre à l'Institut de recherche sur la santé des populations de l'Université d'Ottawa mène de nombreuses études sur la compréhension de la santé et de la perception des risques.

Accepteriez-vous que l'on communique avec vous pour vous fournir des renseignements sur la façon de participer à d'autres études?

Oui 1
Non 2

INFO1

Yes, FUTRSTDS

If... FUTRSTDS = 1

Pouvons-nous fournir vos coordonnées à Dre Louise Lemyre? Ces renseignements seront séparés et isolés de vos réponses au présent sondage. Vos réponses au sondage demeureront confidentielles.

Oui 1
Non 2

THNK

Merci beaucoup d'avoir pris le temps de répondre à ce sondage.

THNK2

Screened-out

Merci de votre collaboration! D'après les renseignements que vous avez donnés, vous n'êtes malheureusement pas admissible à ce sondage.

Computer-Assisted Telephone Interviews (CATI)

Recruitment Text – English



Université d'Ottawa • University of Ottawa

Institut de recherche sur la santé des populations Institute of Population Health

TEXT TO READ ON THE PHONE

Good morning/afternoon/evening. My name is ____ **I'm calling from _____, a survey firm, on behalf of Dr Lemyre of the Institute of Population Health at the University of Ottawa.** We are conducting a survey among men and women in your area concerning various health risks facing Canadians. Your phone number was chosen from a list of random numbers. We will not record your name or address. We are asking you or someone in your household to answer a questionnaire over the telephone on how you perceive a series of health risks. We anticipate that this will take approximately 25 to 30 minutes. Your name or your telephone number will not appear on any of the written material. The analysis of results will be done by computer on a large sample of 1,500 respondents and will compare group averages. This will help to determine how Canadians see health risks, what is most important to them, and what seems acceptable or unacceptable to them. It will serve to enhance the scientific understanding of health risk perception and acceptability.

The telephone interview will take approximately 25 to 30 minutes. The questions are meant to be general and you do not have to reveal any information you do not want to. There are no right or wrong answers. We only want your opinion.

Your participation is **anonymous**. While results of the study will be published, and discussed within the research team, and at research conferences, no one individual's responses to the questions will be shared. All data will be tabulated and maintained by the researchers in accordance with research ethics confidentiality standards.

Do I have your consent to continue with this telephone interview? Or do you prefer we call you back later?

____ **Yes, now** ____ **Yes, later: When?** _____
____ **No**

If no, do not proceed with questionnaire.

Thank you for your time.



TEXTE À LIRE AU TÉLÉPHONE

Bon matin/après-midi/soir. **Je m'appelle _____ et je vous appelle de _____, une compagnie de sondage, de la part de Dr Louise Lemyre de l'Institut de recherche sur la santé des populations de l'Université d'Ottawa.** Nous menons actuellement une enquête chez les hommes et femmes de votre région au sujet de risques pour la santé auxquels font face les Canadiens. Votre numéro de téléphone a été choisi au hasard parmi une liste de numéros téléphoniques. Nous ne saurons pas ni votre nom, ni votre adresse. On demandera à un adulte de votre maisonnée de répondre à un questionnaire téléphonique de 25 à 30 minutes sur comment vous percevez une série de risques de santé. Votre nom et votre numéro de téléphone n'apparaîtront sur aucune transcription écrite. L'analyse des résultats sera complétée par ordinateur sur un grand échantillon de 1500 personnes interrogées et sera comparée par moyennes de groupe. Cela aidera à déterminer comment les Canadiens perçoivent les risques de santé, ce qui leur est le plus important, et ce qui leur semble acceptable ou non. Cela servira de base pour accroître la compréhension scientifique de la perception et l'acceptabilité de risques de santé.

L'entrevue téléphonique prendra environ 25 à 30 minutes. Les questions sont générales et vous n'êtes aucunement obligé de divulguer les informations que vous ne voulez pas. Il n'y a ni de bonnes ni de mauvaises réponses. Nous voulons simplement vos opinions.

Votre participation est **anonyme**. Quoique les résultats de l'étude seront publiés et discutés à des conférences de recherche, ils n'incluront aucune réponse individuelle. Toutes les données seront tabulées et maintenues par les chercheur-es en accord avec les normes de confidentialité de la recherche universitaire.

Ai-je votre consentement pour continuer avec l'entrevue téléphonique maintenant? Ou préférez-vous être rappelé-e à un autre moment?

Oui, maintenant **Oui plus tard : quand?** _____
 Non

Si non, ne continuer pas avec le questionnaire.

Nous vous remercions de votre temps.



INFORMED CONSENT (to be read on the phone)

Dear Sir or Madam:

You are invited by Dr Louise Lemyre from the Institute for Population Health at the University of Ottawa, to participate in a survey regarding health risk perception and risk acceptability. We are aiming to develop a better understanding of risk in order to bridge the gap between statistical evidence, that forms the basis for population health risk assessment, and the psychosocial process of risk perception and risk acceptability. To this end, we hope that you are willing to complete this survey over the phone.

Your input is important to us. The questionnaire will take approximately 25-30 minutes. The questions relate to public risk issues such as: *Do you consider radiation to be a health risk? What is the level of risk associated with vaccines? How frequently do you think people are affected by natural disasters?* The phone survey is being conducted by a reputable firm bound to ethics standards. Your participation is **completely voluntary and anonymous**. While group results of the study will be published, and discussed within the research team, and at research conferences, no one individual's responses to the questions will be shared. All data will be tabulated and maintained by the researchers in accordance with research ethics confidentiality standards.

You are free to withdraw at any time, refuse to participate, or refuse to answer certain questions. There is no direct individual benefit from answering the survey. There is no expected harm or risk except the possible negative feelings sometime associated with self-reflecting on one's health and health risks. However, in the unlikely event of distress or discomfort you may wish to contact the Confidential Help Line within your community. You may also contact the Principal Investigator, Dr Louise Lemyre at the University of Ottawa or the University of Ottawa Research Ethics Board Officer.

Accepting to continue with the phone call will be considered informed consent. We will now start the phone survey. Do you agree to participate?

Thank you, on behalf of

Louise Lemyre, Ph.D., FRSC
Principal Investigator
University of Ottawa Professor

I AGREE TO PARTICIPATE



Université d'Ottawa - University of Ottawa

Institut de recherche sur la santé des populations Institute of Population Health

FORMULAIRE DE CONSENTEMENT (lu au téléphone)

Cher monsieur ou madame :

Vous êtes invité(e) par Dr Louise Lemyre de l'Institut sur la santé des populations de l'Université d'Ottawa à participer à un sondage en ligne portant sur la perception et l'acceptabilité du risque dans le domaine de la santé. Nous cherchons à développer une meilleure compréhension des risques de santé pour pouvoir relier des données statistiques qui sont à la base de l'évaluation de risque avec le processus psychosocial de la perception de risque et de l'acceptabilité de risque. C'est pour cette raison que nous vous demandons de compléter ce sondage.

Votre opinion est importante pour nous. Le questionnaire durera environ 25-30 minutes. Les questions portent sur la perception de risques de santé, par exemple : *Considérez-vous la radiation comme étant un risque de santé ? Quel est le niveau de risque associé avec les vaccins ? À quelle fréquence croyez-vous que les gens sont affectés par des désastres naturels ?* Votre participation est **complètement volontaire et anonyme**. Le sondage téléphonique est réalisé par une firme réputée. Quoique les résultats de l'étude seront publiés et discutés à des conférences de recherches, aucune réponse individuelle aux questions ne sera identifiée. Toutes les données seront tabulées et maintenues par les chercheur-es en accord avec les normes de confidentialité de la recherche universitaire.

Vous pouvez vous retirer n'importe quand ou refuser de répondre à certaines questions. Votre participation à cette étude n'entraîne pas de bénéfices directs. Il n'y a aucun dommage ou risque attendu, à l'exception des possibles émotions négatives quelquefois associées à la réflexion sur la santé et les risques de santé. Néanmoins, dans l'improbable cas de détresse émotionnelle, vous pourriez contacter la Ligne d'aide confidentielle de votre région. Vous pouvez aussi contacter la chercheuse principale Dr Louise Lemyre à l'Université d'Ottawa, ou la coordinatrice du conseil en éthique de recherche de l'Université d'Ottawa.

Accepter de poursuivre cet appel sera considéré comme un consentement éclairé. Nous commencerons alors le questionnaire. Êtes-vous d'accord de participer ?

Merci de la part de,

Louise Lemyre, Ph.D., MSRC
Chercheuse principale , Professeure, Université d'Ottawa

JE VEUX PARTICIPER

Online Survey

Recruitment Text – English



Université d'Ottawa • University of Ottawa

Institut de recherche sur la
santé des populations Institute of
Population Health

RECRUITMENT LETTER FOR ONLINE PARTICIPANTS

Dear Sir or Madam:

You are invited by Dr Louise Lemyre from the Institute for Population Health at the University of Ottawa, to participate in a questionnaire regarding health risk perception and risk acceptability. The survey is conducted among men and women of 18 years of age and older, on various health risks facing Canadians today. We do not know your name or contact information. We are asking you to answer questions via an internet survey on how you perceive a series of health risks. The online survey will be conducted on a secure server. Your name and contact information will not appear on any of the material. The analysis of results will be done by computer on a sample of 500 respondents and group averages will be compared. This will help to determine how Canadians see health risks, which are most important to them, and which appear to be acceptable or unacceptable. Findings from this survey will serve to enhance the scientific understanding of health risk perception and acceptability.

The online survey will take approximately 20 minutes. The questions are meant to be general and you do not have to reveal any information you do not want to. There are no right or wrong answers. We only want your opinion.

Your participation is **anonymous**. While group results of the study will be published, and discussed within the research team, and at research conferences, no one individual's responses to the questions will be shared. All data will be tabulated and maintained by the researchers in accordance with research ethics confidentiality standards.

If you are interested in participating in this online questionnaire, please click on the "I would like to continue" link to be redirected to the informed consent form. If you are not interested in participating, please close your web browser page.

Thank you for your time.

[I WOULD LIKE TO CONTINUE](#)



Université d'Ottawa • University of Ottawa

Institut de recherche sur la santé des populations Institute of Population Health

LETTRE DE RECRUTMENT POUR PARTICIPANTS EN LIGNE

Cher monsieur ou madame :

Vous êtes invité(e) par Dr Louise Lemyre de l'Institut sur la santé des populations de l'Université d'Ottawa à participer à un sondage en ligne portant sur la perception et l'acceptabilité du risque dans le domaine de la santé. Le sondage est distribué à des hommes et femmes de 18 ans et plus, et porte sur les risques de santé auxquels font face les Canadiens. Nous n'avons pas accès à votre nom ni à aucune information personnelle. Nous vous demanderons de répondre à un sondage en ligne portant sur votre perception de certains risques de santé. Le sondage en ligne est mis en place sur un site web sécurisé. Votre nom et votre adresse courriel n'apparaîtront sur aucune transcription des données. L'analyse des résultats sera complétée par ordinateur sur des données de groupe, et seules des moyennes de groupe seront comparées. Les analyses aideront à déterminer comment les Canadiens perçoivent les risques de santé, lesquels ils considèrent plus importants, et lesquels sont considérés comment étant acceptable ou non. Les résultats de ce sondage serviront de base pour améliorer la compréhension scientifique de la perception et l'acceptabilité de risques de santé.

Le sondage en ligne prendra environ 20 minutes. Les questions sont générales et vous n'êtes aucunement obligé de faire parvenir des informations que vous ne voulez pas partager. Il n'y a ni de bonnes ni de mauvaises réponses. Nous voulons simplement votre opinion.

Votre participation est **anonyme**. Quoique les résultats de l'étude seront publiés et discutés à des conférences de recherche, ils n'incluront aucune réponse individuelle. Toutes les données seront tabulées et maintenues par les chercheur-es en accord avec les normes de confidentialité de la recherche universitaire.

Si vous êtes intéressé à participer à ce sondage en ligne, veuillez s'il-vous-plait cliquer sur le lien « je veux continuer » pour être redirigé au formulaire de consentement. Si vous n'êtes pas intéressé, veuillez s'il-vous-plait fermer la fenêtre du site web.

Nous vous remercions de votre temps.

JE VEUX CONTINUER



INFORMED CONSENT (to be posted on website)

Dear Sir or Madam:

You are invited by Dr Louise Lemyre from the Institute for Population Health at the University of Ottawa, to participate in a survey regarding health risk perception and risk acceptability. We are aiming to develop a better understanding of risk in order to bridge the gap between statistical evidence, that forms the basis for population health risk assessment, and the psychosocial process of risk perception and risk acceptability. To this end, we hope that you are willing to complete the online survey.

Your input is important to us. The questionnaire will take approximately 20 minutes. The questions relate to public risk issues such as: *Do you consider radiation to be a health risk? What is the level of risk associated with vaccines? How frequently do you think people are affected by natural disasters?* The online survey is conducted on a secure server. Your participation is **completely voluntary and anonymous**. While group results of the study will be published, and discussed within the research team, and at research conferences, no one individual's responses to the questions will be shared. All data will be tabulated and maintained by the researchers in accordance with research ethics confidentiality standards.

You are free to withdraw at any time, refuse to participate, or refuse to answer certain questions. There is no direct individual benefit from answering the survey. There is no expected harm or risk except the possible negative feelings sometime associated with self-reflecting on one's health and health risks. However, in the unlikely event of distress or discomfort you may wish to contact the Confidential Help Line within your community. You may also contact the Principal Investigator, Dr Louise Lemyre at the University of Ottawa or the University of Ottawa Research Ethics Board Officer.

Clicking on the "I agree to participate" will be considered informed consent. You will be redirected to the online survey. If you do not agree to participate, please click on the "close" button of your browser. You may choose to print a copy of this informed consent form for your records. Sincerely,

Louise Lemyre, Ph.D., FRSC
Principal Investigator
University of Ottawa Professor

I am 18 years of age or older and I AGREE TO PARTICIPATE



Université d'Ottawa • University of Ottawa

Institut de recherche sur la
santé des populations

Institute of
Population Health

FORMULAIRE DE CONSENTEMENT (affiché sur le site web)

Cher monsieur ou madame :

Vous êtes invité(e) par Dr Louise Lemyre de l'Institut sur la santé des populations de l'Université d'Ottawa à participer à un sondage en ligne portant sur la perception et l'acceptabilité du risque dans le domaine de la santé. Nous cherchons à développer une meilleure compréhension des risques de santé pour pouvoir relier des données statistiques qui sont à la base de l'évaluation de risque avec le processus psychosocial de la perception de risque et de l'acceptabilité de risque. C'est pour cette raison que nous vous demandons de compléter ce sondage électronique.

Votre opinion est importante pour nous. Le questionnaire durera environ 20 minutes. Les questions portent sur la perception de risques de santé, par exemple : *Considérez-vous la radiation comme étant un risque de santé ? Quel est le niveau de risque associé avec les vaccins ? À quelle fréquence croyez-vous que les gens sont affectés par des désastres naturels ?* Votre participation est **complètement volontaire et anonyme**. Le sondage est en ligne et est mis en place sur un site web sécurisé. Quoique les résultats de l'étude seront publiés et discutés à des conférences de recherches, aucune réponse individuelle aux questions ne sera identifiée. Toutes les données seront tabulées et maintenues par les chercheur-es en accord avec les normes de confidentialité de la recherche universitaire.

Vous pouvez vous retirer n'importe quand ou refuser de répondre à certaines questions. Votre participation à cette étude n'entraîne pas de bénéfices directs. Il n'y a aucun dommage ou risque attendu, à l'exception des possibles émotions négatives quelques fois associées à la réflexion sur la santé et les risques de santé. Néanmoins, dans l'improbable cas de détresse émotionnelle, vous pourriez contacter la Ligne d'aide confidentielle de votre région. Vous pouvez aussi contacter la chercheuse principale Dr Louise Lemyre à l'Université d'Ottawa ou la coordinatrice du conseil en éthique de recherche de l'Université d'Ottawa.

Pour donner votre consentement pour participer, cliquer sur "Je veux participer". Vous serez ensuite dirigé au sondage en ligne. Si vous n'acceptez pas de participer, veuillez s'il-vous-plait cliquer sur le bouton "fermer" situé sur le haut de la page web. Vous pouvez imprimer une copie du formulaire de consentement pour vos documents. Sincèrement,

Louise Lemyre, Ph.D., MSRC
Chercheuse principale , Professeure, Université d'Ottawa

J'ai plus de 18 ans et je veux participer

Appendix B: Focus Group Materials

Focus Group Guide – English

Please remember there is no right or wrong answers. I am looking for your opinions. You can think of each question as being proceeded by “In your opinion...”

Vaccines – General Knowledge

- When you hear the word “vaccine”, what are the first words or phrases that come to mind?
- If you had to describe or explain “vaccines” to someone, how would you do so?
 - What is the primary role of vaccines?

Common Beliefs

There may be some opinions or beliefs about vaccines in general and about a specific vaccine that you hear more often.

- When you hear people talking about vaccines, what are some of the most common things you hear being said (either about vaccines in general or about a specific vaccine – e.g., influenza vaccine)?
 - Would you consider this as “common knowledge” about vaccines?
 - Do you think is information is mostly accurate?

Sources of information

- Where do you get most of your health-related information, including information on vaccines?
 - Newspapers, Radio, Television
 - Internet, Social media (e.g., Facebook, Twitter)
 - Family, Friends, Coworkers
 - Experts
- Do you trust the information you receive?
- If you have a question or concern about vaccine-related information, including questions or concerns about specific vaccines, vaccination schedules, etc., where and/or from whom do you get answers?
- Is information about vaccines confusing?
- Are you satisfied with the vaccine-related information provided to you?
 - What are you unsatisfied with?

The value of vaccines

Necessity of vaccines

- Are vaccines necessary in Canada? Why?
 - Are there certain vaccines that you believe may be less necessary than others? Why?

Vaccine effectiveness

- Do vaccines provide complete protection against diseases?
- Do vaccines provide long-term protection against diseases?

Vaccine safety

- Vaccine side effects are believed to range from minor (e.g., sore arm, tiredness) to serious (allergic reactions, febrile seizures): what are your thoughts on adverse reactions resulting from receiving a vaccine?
- Are you concerned with the safety of vaccines? Why?

Risk/Benefit & Vaccine Acceptability

- What are the benefits associated with vaccines?
- Are there serious health risks associated with vaccines?
 - Are there any risks associated with vaccines?
- Do the benefits of vaccines outweigh the risks?

Uncertainty

- Do you think there is certain amount of uncertainty surrounding vaccines?
- What are some aspects that may be related to uncertainty surrounding vaccines?
 - *Probes:*
 - Novelty of vaccines (e.g., H1N1, HPV)
 - Unknown long-term side effects
- Are there certain vaccines that you feel more uncertainty towards?

Role of Regulators

Government

- What role do government health authorities play in:
 - The development of new vaccines?
 - The delivery of vaccines (ensuring that vaccines are available and easily accessible to everyone in the population)?

Physicians and healthcare providers

- Do you usually follow recommendations from your doctor?
- Do you believe that healthcare providers, such as nurses and doctors, are well informed on all aspects of vaccines and immunization?
- Would your doctor's recommendation to receive a vaccine (e.g., influenza vaccine) influence your decision?

Influenza vaccine

- What are your thoughts on and/or experiences with the seasonal flu (influenza) vaccine?
 - Do you think it is necessary? Why?
 - Do you think it is effective? Why?
 - Do you think it is safe? Why?
 - Are you concerned with experiencing side effects associated with the vaccine?
- What are the reasons you think people should receive the influenza vaccine?
- What are the reasons you think people should NOT receive the influenza vaccine?

Access

- To what extent does the access to the influenza vaccine affect your decision to get vaccinated?
- Is the influenza vaccine always available and easily accessible during the flu season?

Focus Group Guide – French

S'il vous plaît rappelez-vous il n'y a pas de bonnes ou de mauvaises réponses. Je cherche vos opinions. Vous pouvez penser à chaque question comme objet de poursuites par 'A votre avis'

Vaccins – Général

- Lorsque vous entendez le mot « vaccin », quels sont les premiers mots ou les premières phrases qui vous viennent à l'esprit?
- Si vous deviez décrire ou expliquer ce qu'est un « vaccin » à quelqu'un, comment le feriez-vous?
 - Quel est le rôle principal des vaccins?

Idées communes

Les gens ont plusieurs attitudes et opinions par rapport aux vaccins, et certaines opinions semblent être plus communes que d'autre.

- Lorsque vous entendez des conversations au sujet de vaccins, quelles sont les idées ou opinions que vous entendez le plus souvent (soit par rapport aux vaccins en général ou bien à un vaccin en particulier – e.g., le vaccin contre l'influenza)?
 - Croyez-vous que cette information est une connaissance commune?
 - Croyez-vous que cette information est principalement vraie?

Sources d'information

- À quel endroit allez-vous pour obtenir la plupart des renseignements sur la santé ou vers qui vous tournez-vous?
 - Journaux, Radio, Télévision
 - Internet, Les médias sociaux (ex. Facebook, Twitter)
 - Famille, Amis, Collègues de travail
 - Experts
- Faites-vous confiance à l'information que vous recevez?
- Si vous avez une question ou une inquiétude au sujet d'un renseignement concernant un vaccin, y compris des questions ou des préoccupations au sujet de certains vaccins, des calendriers de vaccination, etc., à quel endroit allez-vous chercher des réponses ou à qui vous adressez-vous?
- Êtes-vous satisfait des renseignements sur les vaccins qui vous sont fournis?
 - Pourquoi êtes-vous insatisfait?

Importance des vaccins

Nécessité des vaccins

- Est-ce que les vaccins sont nécessaires au Canada? Pourquoi?
 - Y-a-t 'il certains vaccins qui sont, d'après vous, plus ou moins nécessaires que d'autres? Pourquoi?

Efficacité des vaccins

- Est-ce que les vaccins fournissent efficacement une immunisation complète contre les maladies?
- Est-ce que les vaccins fournissent efficacement une immunisation à long terme contre les maladies?

Innocuité des vaccins

- On estime que les effets secondaires des vaccins vont de légers (bras endolori, fatigue) à graves (réactions allergiques, poussées fébriles) : que pensez-vous des effets indésirables liés à l'administration d'un vaccin?
- Êtes-vous préoccupé par l'innocuité des vaccins?

Risques/avantages & Acceptabilité des vaccins

- Quels sont les avantages associés aux vaccins?
- Les vaccins sont-ils associés avec des risques de santé sérieux?
 - Y-a-t 'il des risques associés aux vaccins?
- Est-ce que les avantages des vaccins sont plus importants que les risques?

Incertitude

- Existe-t-il une certaine incertitude entourant les vaccins?
- Quels sont les aspects qui suscitent l'incertitude entourant les vaccins?
 - *Questions supplémentaires :*
 - Nouveaux vaccins (H1N1, papillomavirus/VPH)
 - Effets secondaires à long terme inconnus
 - Contradiction entre les renseignements scientifiques
- Quels vaccins donnent lieu à la plus grande incertitude?

Gouvernement

- Quelle est le rôle des autorités gouvernementales dans :
 - Le développement de nouveaux vaccins?
 - La mise au point et l'administration des vaccins (assurer que les vaccins sont disponibles et facilement accessible pour tous)?

Médecins et fournisseurs de soins de santé

- Respectez-vous normalement les recommandations de votre médecin?
- Croyez-vous que les professionnels de la santé, comme les infirmières et les docteurs, sont bien informés sur tous les aspects portant sur les vaccins et la vaccination?
- Si votre médecin vous recommande de recevoir le vaccin antigrippal, cette recommandation influencera-t-elle votre décision?

Vaccin antigrippal

- Quelle est votre vision du vaccin contre la grippe saisonnière ou quelles en sont vos expériences?
- Pensez-vous que ce vaccin est nécessaire? Pourquoi?
- Pensez-vous que ce vaccin est efficace? Pourquoi?
- Pensez-vous que ce vaccin est sûr? Pourquoi?
 - Êtes-vous préoccupé par les effets secondaires associés à ce vaccin?
- Pour quelles raisons une personne devrait-elle recevoir le vaccin antigrippal?
- Pour quelles raisons une personne NE devrait-elle PAS recevoir le vaccin antigrippal?

Accès

- À votre avis, le vaccin antigrippal est-il offert et est-il facilement accessible au cours de la saison de la grippe?
- Si vous ou quelqu'un que vous connaissez souhaite recevoir le vaccin antigrippal au cours de la saison de la grippe, croyez-vous que le processus pour se faire vacciner est facile et pratique?

Focus Group Recruitment Text – English



Université d'Ottawa • University of Ottawa

Institut de recherche sur la santé des populations Institute of Population Health

FACTORS INFLUENCING VACCINE HESITANCY

You are invited by Dr. Lemyre and Dr. Krewski from the Institute for Population Health at the University of Ottawa to participate in a focus group on attitudes and beliefs about vaccines and immunization.

The goal is to conduct a series of focus groups to better understand how members of the general public perceive vaccines. The focus groups are conducted in order to acquire informal information on the level of importance allocated to vaccine risks and benefits and what factors guide decision-making processes regarding vaccination.

Your opinion is important to us. You will be asked to participate in a group discussion with 5 to 6 other participants during which a researcher will ask you questions related to vaccines. A voice recorder will be used to tape the session and the researcher may also take notes in order to keep track of the themes being discussed. The entire session will be transcribed in a secure computer file for subsequent content analysis. Your name will not appear on any of the transcripts. Common themes and ideas from the discussion will be analysed. Results will provide us with a better understanding of the important factors influencing group opinions and beliefs about vaccines. It will serve as the basis for enhancing scientific understanding of vaccine risk perception and acceptability in Canada.

The focus group will last approximately 1 to 1.5 hours. Questions of the following type will be asked: “*How do you feel about vaccines? Do you consider the Canadian population is well informed about vaccine risks and benefits? Is vaccine safety a concern for you?*” Your answers can be general and any information disclosed is at your discretion. There are no right or wrong answers. We only want your opinion.

All personal identifying information will be kept confidential. You will not be identifiable in any publications or presentations resulting from this study. While group results of the study will be published and discussed within the research team, and at research conferences, no one individual’s responses will be identified. These results will also be reported in the thesis projects of students at the University of Ottawa. All data will be tabulated and maintained by the researchers in accordance with university research ethics standards.

Please contact Andrea if you are interested in participating:

And leave us your phone number or email

Focus Group Recruitment Text – French



FACTEURS ASSOCIÉS AVEC L'HÉSITATION À LA VACCINATION

Vous êtes invité(e) par Dr. Lemyre et Dr. Krewski de l'Institut sur la santé des populations de l'Université d'Ottawa à participer à une entrevue sur les attitudes et croyances concernant les vaccins et la vaccination.

Le but est de mener une série de groupes de discussion afin de mieux comprendre comment les professionnels de la santé (infirmières) perçoivent les vaccins. Les groupes de discussion ont comme but d'acquérir de l'information détaillée portant sur l'importance allouée aux risques et bénéfices associés aux vaccins et quels facteurs guident le processus de la prise de décisions portant sur la vaccination.

Votre opinion est importante pour nous. Nous vous demanderons de participer à un groupe de discussion durant laquelle une chercheuse vous posera des questions portant sur les vaccins et la vaccination. Un appareil sera utilisé pour enregistrer la conversation et la chercheuse prendra aussi des notes pour garder en tête les thèmes de la discussion. La discussion sera transcrite et ensuite inscrite dans un fichier d'ordinateur sécurisé pour analyse. Votre nom n'apparaîtra sur aucune transcription écrite. L'analyse des résultats se concentrera sur les thèmes et idées communes des membres du groupe de discussion. Cela aidera à mieux comprendre les facteurs importants qui influencent les opinions et points de vue sur les risques de santé. Cela servira de base pour améliorer la compréhension des facteurs qui influence l'hésitation à la vaccination.

Le groupe de discussion durera environ 1 à 1.5 heures. Des questions seront demandées, du type : *Que pensez-vous des vaccins? Est-ce que la sécurité des vaccins vous inquiète?* Vos réponses peuvent être générales et vous n'êtes aucunement obligé de divulguer les informations que vous ne voulez pas partager. Il n'y a ni de bonnes ni de mauvaises réponses. Nous voulons simplement votre opinion.

Votre identité restera **confidentielle** et vos réponses seront liées à un numéro de code. Quoique les résultats de l'étude seront publiés et discutés à des conférences de recherches, aucune réponse individuelle ne sera identifiée. Toutes les données seront tabulées et maintenues par les chercheur-es en accord avec les normes de confidentialité de la recherche universitaire.

Veillez contacter Andrea si vous êtes intéressé(e) à participer

Et laissez-nous vos coordonnées (numéro de téléphone ou courriel électronique).

Focus Group Consent Form – English



CONSENT FORM

FACTORS INFLUENCING VACCINE HESITANCY

Introduction

You are invited by Dr. Lemyre and Dr. Krewski from the Institute for Population Health at the University of Ottawa to participate in a focus group on attitudes and beliefs about vaccines and immunization.

Purpose

The goal is to conduct a series of focus groups to better understand how members of the general public perceive vaccines. The focus groups are conducted in order to acquire informal information on the level of importance allocated to vaccine risks and benefits and what factors guide decision-making processes regarding vaccination.

Study Procedures

Your opinion is important to us. You will be asked to participate in a group discussion with 5 to 6 other participants during which a researcher will ask you questions related to vaccines. A voice recorder will be used to tape the session and the researcher may also take notes in order to keep track of the themes being discussed. The entire session will be transcribed in a secure computer file for subsequent content analysis. Your name will not appear on any of the transcripts. Common themes and ideas from the discussion will be analysed. Results will provide us with a better understanding of the important factors influencing group opinions and beliefs about vaccines. It will serve as the basis for enhancing scientific understanding of vaccine risk perception and acceptability in Canada.

Duration

The focus group will last approximately 1 to 1.5 hours. Questions of the following type will be asked: “*How do you feel about vaccines? Do you consider the Canadian population is well informed about vaccine risks and benefits? Is vaccine safety a concern for you?*” Your answers can be general and any information disclosed is at your discretion. There are no right or wrong answers. We only want your opinion.

Possible Risks

There is no expected harm or risk, except for possible negative feelings sometimes associated with self-reflecting on one's health and health risks. However, in the unlikely event of distress or discomfort, you may wish to contact the Confidential Help Line within your community. You may also contact the Principal Investigators, Dr. Louise Lemyre, Dr. Daniel Krewski, or the University of Ottawa Research Ethics Board Officer.

Benefits

There is no direct individual benefit from participating in the focus group.

Confidentiality

All personal identifying information will be kept confidential. You will not be identifiable in any publications or presentations resulting from this study. While group results of the study will be published and discussed within the research team, and at research conferences, no one individual's responses will be identified. These results will also be reported in the thesis projects of students at the University of Ottawa. All data will be tabulated and maintained by the researchers in accordance with university research ethics standards.

Voluntary Participation/ Withdrawal from the Study

Participation is completely voluntary. You are free to withdraw from the study at any time, choose not to participate, or choose not to answer certain questions.

Presence at the focus group session and signing this form will be considered informed consent.

There are two copies of this form, one for you, one for the research team.

Louise Lemyre, Ph.D., FRSC
Principal Investigator
Professor University of Ottawa

Participant's Name (Please Print)

Participant's Signature

Date

Researcher's Signature

Date



FORMULAIRE DE CONSENTEMENT

FACTEURS INFLUENÇANT LA RÉTICENCE PAR RAPPORT AUX VACCINS

Introduction

Vous êtes invité(e) par Dr. Lemyre et Dr. Krewski de l'Institut sur la santé des populations de l'Université d'Ottawa à participer à un groupe de discussion sur les attitudes et croyances concernant les vaccins et la vaccination.

Objectif

Le but est de mener une série de discussions afin de mieux comprendre comment les membres du public perçoivent les vaccins. Les groupes de discussion sont menées pour acquérir de l'information détaillée sur l'importance accordée aux risques et aux avantages liés aux vaccins et aux facteurs qui influencent la prise de décision en matière de vaccination.

Procédures de l'étude

Votre opinion est importante pour nous. Nous vous demanderons de participer à un groupe de discussion durant lequel une chercheuse posera des questions au groupe sur les vaccins et la vaccination. Un appareil sera utilisé pour enregistrer la conversation et la chercheuse prendra aussi des notes pour garder en tête les thèmes de la discussion. La discussion sera transcrite dans un fichier d'ordinateur sécurisé pour l'analyse. Votre nom n'apparaîtra sur aucune transcription écrite. L'analyse des résultats se concentrera sur les thèmes et idées communes de la discussion. Les résultats permettront de mieux comprendre les facteurs importants qui influencent les opinions et les croyances individuelles au sujet des vaccins.

Durée de l'étude

Le groupe de discussion durera environ 1 à 1.5 heures. On vous posera des questions du genre : *Que pensez-vous des vaccins? Croyez-vous que la population canadienne est bien informée au sujet des risques et des avantages des vaccins? Êtes-vous préoccupé par l'innocuité des vaccins?* Vous pouvez répondre de façon générale et vous êtes libre de donner autant de détails que vous voulez. Vous n'êtes aucunement obligé de divulguer les informations que vous ne voulez pas partager. Il n'y a ni de bonnes ni de mauvaises réponses. Nous voulons simplement votre opinion.

Risques possibles

Il n'y a aucun dommage ou risque attendu, à l'exception des possibles émotions négatives quelquefois associées à la réflexion sur la santé et les risques de santé. Néanmoins, dans l'improbable cas de détresse émotionnelle, vous pouvez contacter la Ligne d'aide confidentielle de votre région. Vous pouvez aussi contacter la chercheuse principale, Dr Louise Lemyre, à l'Université d'Ottawa, ou la coordonnatrice du Service de l'éthique en recherche.

Avantage

Votre participation à cette étude n'entraîne pas de bénéfices directs.

Votre signature et présence au groupe de discussion seront considérées un consentement éclairé.

Confidentialité

Tous les renseignements personnels seront confidentiels. Vous ne pourrez être identifié dans aucune publication ou présentation découlant de cette étude. Quoique les résultats de l'étude seront publiés et discutés à des conférences de recherches, aucune réponse individuelle aux questions ne sera identifiée. Les résultats de l'étude seront aussi inclut dans les thèses d'étudiants de l'Université d'Ottawa. Toutes les données seront tabulées et maintenues par les chercheur-es en accord avec les normes de confidentialité de la recherche universitaire.

Participation et retrait volontaires dans le cadre de l'étude

La participation à l'étude est entièrement volontaire. Vous êtes libre de vous retirer en tout temps de l'étude, de choisir de ne pas participer ou de ne pas répondre à certaines questions.

Votre signature et présence au groupe de discussion seront considérées un consentement éclairé.

Il y a deux copies de ce formulaire, l'une pour vous, l'autre pour l'équipe de chercheurs.

Louise Lemyre, Ph.D., MSRC

Chercheure principale

Professeure, Université d'Ottawa

Nom du participant (caractères d'imprimerie)

Signature du participant

Date

Signature de la chercheuse

Date

Socio-Demographic Information – English

SOCIO-DEMOGRAPHIC QUESTIONS

Participant code (researcher only): _____

Age: _____ years old

Gender (please circle): **M** **F**

Citizenship: _____

Are you a parent (please circle): **Y** **N**

What language do you speak most often at home: _____

Highest level of education: _____

Socio-Demographic Information – French

QUESTIONS SOCIO-DEMOGRAPHIQUES

Code du participant (chercheur): _____

Age: _____ ans

Genre (encerclez): **H** **F**

Citoyenneté: _____

Êtes-vous parent (encerclez): **Oui** **Non**

Quelle langue parlez-vous le plus souvent à la maison: _____

Plus haut niveau d'éducation: _____

Appendix C: Notices of Ethical Approval

File Number: H12-02-08B

Date (mm/dd/yyyy): 03/01/2012



Université d'Ottawa **University of Ottawa**
Bureau d'éthique et d'intégrité de la recherche Office of Research Ethics and Integrity

Ethics Approval Notice Health Sciences and Science REB

Principal Investigator / Supervisor / Co-investigator(s) / Student(s)

<u>First Name</u>	<u>Last Name</u>	<u>Affiliation</u>	<u>Role</u>
Louise	Lemyre	Social Sciences / Psychology	Principal Investigator

File Number: H12-02-08B

Type of Project: Professor

Title: Risk Perception: Trends and Key Factors

Approval Date (mm/dd/yyyy)	Expiry Date (mm/dd/yyyy)	Approval Type
03/01/2012	02/28/2013	Ia

(Ia: Approval, Ib: Approval for initial stage only)

Special Conditions / Comments:

N/A

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550, rue Cumberland Ottawa, Ontario K1N 6N5 Canada
550 Cumberland Street Ottawa, Ontario K1N 6N5 Canada
(613) 562-5841 • Téléc./Fax (613) 562-5338
<http://www.research.uottawa.ca/ethics/index.html>
<http://www.recherche.uottawa.ca/deontologie/index.html>



Université d'Ottawa **University of Ottawa**
Bureau d'éthique et d'intégrité de la recherche Office of Research Ethics and Integrity

This is to confirm that the University of Ottawa Research Ethics Board identified above, which operates in accordance with the Tri-Council Policy Statement and other applicable laws and regulations in Ontario, has examined and approved the application for ethical approval for the above named research project as of the Ethics Approval Date indicated for the period above and subject to the conditions listed the section above entitled "Special Conditions / Comments".

During the course of the study the protocol may not be modified without prior written approval from the REB except when necessary to remove subjects from immediate endangerment or when the modification(s) pertain to only administrative or logistical components of the study (e.g. change of telephone number). Investigators must also promptly alert the REB of any changes which increase the risk to participant(s), any changes which considerably affect the conduct of the project, all unanticipated and harmful events that occur, and new information that may negatively affect the conduct of the project and safety of the participant(s). Modifications to the project, information/consent documentation, and/or recruitment documentation, should be submitted to this office for approval using the "Modification to research project" form available at:
http://www.rges.uottawa.ca/ethics/application_dwn.asp

Please submit an annual status report to the Protocol Officer 4 weeks before the above-referenced expiry date to either close the file or request a renewal of ethics approval. This document can be found at:
http://www.rges.uottawa.ca/ethics/application_dwn.asp

If you have any questions, please do not hesitate to contact the Ethics Office at extension 5841 or by e-mail at: ethics@uOttawa.ca.

Signature:

Catherine Paquet
Director
For Daniel Lagarec, Chair of the Sciences and Health Sciences REB



Université d'Ottawa **University of Ottawa**
 Bureau d'éthique et d'intégrité de la recherche Office of Research Ethics and Integrity

Ethics Approval Notice
Health Sciences and Science REB

Principal Investigator / Supervisor / Co-investigator(s) / Student(s)

<u>First Name</u>	<u>Last Name</u>	<u>Affiliation</u>	<u>Role</u>
Louise	Lemyre	Social Sciences / Psychology	Principal Investigator
Andrea	Perna	Health Sciences / Others	Student-Researcher

File Number: H12-02-08B

Type of Project: Professor

Title: Risk Perception: Trends and Key Factors

Renewal Date (mm/dd/yyyy)	Expiry Date (mm/dd/yyyy)	Approval Type
03/01/2013	02/28/2014	Ia

(Ia: Approval, Ib: Approval for initial stage only)

Special Conditions / Comments:
N/A



Université d'Ottawa **University of Ottawa**
Bureau d'éthique et d'intégrité de la recherche Office of Research Ethics and Integrity

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Please submit an annual status report to the Protocol Officer four weeks before the above-referenced expiry date to either close the file or request a renewal of ethics approval. This document can be found at: <http://www.research.uottawa.ca/ethics/forms.html>.

If you have any questions, please do not hesitate to contact the Ethics Office at extension 5387 or by e-mail at: ethics@uOttawa.ca.

Signature:

Germain Zongo
Protocol Officer for Ethics in Research
For Daniel Lagarec, Chair of the Sciences and Health Sciences REB



Ethics Approval Notice
Health Sciences and Science REB

Principal Investigator / Supervisor / Co-investigator(s) / Student(s)

<u>First Name</u>	<u>Last Name</u>	<u>Affiliation</u>	<u>Role</u>
Louise	Lemyre	Social Sciences / Psychology	Principal Investigator
Andrea	Perna	Health Sciences / Others	Student Researcher

File Number: H12-02-08B

Type of Project: Professor

Title: Risk Perception: Trends and Key Factors

Renewal Date (mm/dd/yyyy)	Expiry Date (mm/dd/yyyy)	Approval Type
03/01/2014	02/28/2015	Ia

(Ia: Approval, Ib: Approval for initial stage only)

Special Conditions / Comments:

N/A



Université d'Ottawa
Bureau d'éthique et d'intégrité de la recherche

University of Ottawa
Office of Research Ethics and Integrity

This is to confirm that the University of Ottawa Research Ethics Board identified above, which operates in accordance with the Tri-Council Policy Statement and other applicable laws and regulations in Ontario, has examined and approved the application for ethical approval for the above named research project as of the Ethics Approval Date indicated for the period above and subject to the conditions listed the section above entitled "Special Conditions / Comments".

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If you have any questions, please do not hesitate to contact the Ethics Office at extension 5387 or by e-mail at: ethics@uOttawa.ca.

Mélanie Rioux
Ethics Coordinator
For Gilles Morier, Acting Director of the Office of Research Ethics and Integrity