

Assessing the Predictive Validity of Psychosocial Factors on Influenza Vaccine
Acceptance among Health Care Workers: A Multi-Study Design

Jason M. Slaunwhite

A thesis submitted to the Department of Psychology
in conformity with the requirements for
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-Approved	Steven M. Smith, PhD Supervisor
-Approved	Mark T. Fleming, PhD Internal Committee Member
-Approved	Catherine Loughlin, PhD Internal Committee Member
-Approved	Robert Strang, MD Internal Committee Member
-Approved	Kathryne E. Dupré, PhD External Committee Member

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Assessing the Predictive Validity of Psychosocial Factors on Influenza Vaccine Acceptance among Health Care Workers: A Multi-study Design

by Jason M. Slaunwhite

Abstract

Seasonal influenza vaccination of Health Care Workers (HCWs) is the most effective method to protect staff and patients during influenza epidemics. Although Canadian provincial and territorial governments offer a publically funded influenza vaccine to all individuals working in and around the healthcare sector, vaccine uptake is remarkably low. This dissertation follows a multi-year multi-study initiative targeting HCW vaccine uptake.

In Study 1, a novel Theory of Planned Behaviour (TPB) intervention was created and tested to determine if the presence of a unit champion had a positive impact on seasonal influenza vaccine uptake among a HCW population. The results of Study 1 suggest tailored interventions, such as the peer champion process, are effective at increasing HCW vaccination rates. A call for further examination into the utility of psychosocial predictors is made.

Study 2 was designed to determine which elements of a modified TPB framework were predictive of HCW's intentions to receive seasonal influenza vaccine. Results partially support the use of a modified TPB, over and above a measure of past behaviour, when predicting HCW influenza vaccination. HCW's attitudes toward seasonal influenza vaccination were a strong and significant predictor of intentions to receive vaccine. The relative strength of normative influences such as moral responsibility and estimated vaccine uptake of peers are explored as potential additions to the subjective norm factor.

Study 3 tested the adequacy of the TPB in explaining intention to receive vaccine including a modified PBC item set, tested the predictive ability of intention to receive vaccine on actual vaccine uptake, and attempted to replicate the findings of Study 2. Results show that past behaviour was able to account for a small but significant increase in intentions to receive vaccine; however, past behaviour was not able to account for additional variance in vaccine uptake. The predictive strength of attitudes toward seasonal influenza vaccine was replicated.

A general discussion synthesizes the findings from studies 1, 2 and 3. The adequacy of an extended TPB model to predict seasonal influenza vaccine among a HCW population is examined and a call for tailored interventions is made. Limitations and future research activities are discussed.

Submitted April 19, 2012

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Table of Contents

List of Tables	5
List of Figures	6
List of Acronyms	7
CHAPTER 1: INTRODUCTION	8
Effectiveness of Seasonal Influenza Vaccine within a HCW Population.....	10
Patient Safety	12
CHAPTER 2: Secondary Literature Review	16
Understanding and Predicting Behavioural Change: The Influence of Psychosocial Predictors on Health Related Behaviours	16
CHAPTER 3: Study 1	26
Overview and Goals.....	26
Development of a TPB Based Intervention: Increasing Vaccine Uptake Through Peer Vaccine Champions	26
Methodology	29
Results.....	32
CHAPTER 4: Study 2.....	42
Understanding the psychosocial predictors of seasonal influenza vaccine acceptance among health care workers: An exploratory study	42
Extending Subjective Norms to Include Additional Social Perceptions & Influence ..	42
Overview and Goals.....	51
Methodology	52
Results.....	58
Discussion	71
CHAPTER 5: Study 3	77
A constructive validation study and establishing an intention-behaviour link	77
Overview and Goals.....	77
Methodology	81
Results.....	89
Follow-up Analysis: Promoting seasonal influenza vaccine with unit champions.....	94
Discussion	100
CHAPTER 6: General Discussion	106
The influence of the TPB in predicting seasonal vaccine uptake among HCWs	107
<i>Subjective, descriptive and injunctive normative influences</i>	112
<i>Perceived Behavioural Control</i>	115
<i>Past Behaviour</i>	119
<i>Barriers and Drivers of Seasonal Influenza Vaccine for HCWs</i>	120
Theoretical Contributions	122
Practical Contributions.....	123
<i>Increasing Seasonal Influenza Vaccine</i>	124
<i>Attitude Stability</i>	126
<i>Vaccine Status of Direct Supervisors</i>	126
Limitations	127

Conclusion	130
References.....	132
Appendix A: Invitation to unit managers.....	141
Appendix B: Overview of specific elements of champion training.....	142
Appendix C: Study 2 consent form.....	144
Appendix D: Invitation to participate in online survey: Study 2	146
Appendix E: Information sheet for online survey in Study 2	147
Appendix F: Perceptions toward influenza vaccine survey	149
Appendix G: Informed consent: Study 3	151
Appendix H: Immunization policy for participating healthcare organization in Studies 1 & 2	153
Appendix I: Immunization policy for participating healthcare organization in Study 3 ..	157

List of Tables

<i>Table 1: Sample of health behaviour theories and models from 1986-2005</i>	<i>22</i>
<i>Table 2: TPB elements within the peer vaccine champion intervention.....</i>	<i>28</i>
<i>Table 3: Rotated factor loadings for principle components analysis of TPB items (pattern matrix)</i>	<i>61</i>
<i>Table 4: Rotated factor loadings for expanded TPB model (pattern matrix)</i>	<i>65</i>
<i>Table 5: Interclass correlations, means and standard deviations of influenza survey variables for Study 2 using nonparametric Kendall's Tau analysis.</i>	<i>67</i>
<i>Table 6: Summary of logistic regression analysis for variables predicting intentions to receive seasonal influenza vaccine</i>	<i>70</i>
<i>Table 7: Rotated factor solution-PBC</i>	<i>86</i>
<i>Table 8: Descriptive data for measures used in Study 3 using nonparametric Kendall's Tau analysis.</i>	<i>87</i>
<i>Table 9: Predicting intentions to receive seasonal influenza vaccine: Hierarchical regression analysis.....</i>	<i>91</i>
<i>Table 10: Hierarchical logistic regression analysis examining the incremental variance explained by the addition of TPB variables and past vaccine uptake</i>	<i>93</i>
<i>Table 11: Predicting intentions to receive seasonal influenza vaccine among HCWs exposed to a champion: Hierarchical regression analysis.....</i>	<i>97</i>
<i>Table 12: Predicting intentions to receive seasonal influenza vaccine among HCWs exposed to a champion: Hierarchical regression analysis excluding a measure of normative influence</i>	<i>99</i>
<i>Table 13: Crosstabulation of individuals exposed to a peer vaccine champion and vaccine uptake.....</i>	<i>100</i>

List of Figures

<i>Figure 1: Theory of Reasoned Action</i>	<i>18</i>
<i>Figure 2: Theory of Planned Behaviour</i>	<i>20</i>
<i>Figure 3: Influenza vaccination rates in experimental and control condition (N = 23 matched pairs)</i>	<i>34</i>
<i>Figure 4: Influenza vaccination rates for 2004 and 2005 (N = 23 matched pairs</i>	<i>35</i>
<i>Figure 5: Proposed model linking injunctive norms and descriptive norms with Subjective Norms of TPB.....</i>	<i>46</i>
<i>Figure 6: Proposed model assessing the impact of the TPB on HCW's intentions to receive seasonal influenza vaccine</i>	<i>49</i>
<i>Figure 7: Scree Plot for preliminary TPB principal components analysis</i>	<i>60</i>
<i>Figure 8; Scree plot for secondary TPB principal components analysis with addition of injunctive and descriptive norm items</i>	<i>64</i>
<i>Figure 9: Proposed model assessing the impact of the TPB on HCW's intentions to receive seasonal influenza vaccine and subsequent vaccine uptake</i>	<i>80</i>
<i>Figure 10: Scree Plot-PBC Items for Study 3.....</i>	<i>85</i>

List of Acronyms

ASE	Attitude-Social influence-Efficacy model
CCIAIP	Canadian Coalition for Immunization Awareness and Promotion
DHA	District Health Authority
EFA	Exploratory Factor Analysis
ELM	Elaboration Likelihood Model
FDA	Food and Drug Administration
FTNC	Focus Theory of Normative Conduct
H1N1	Influenza A subtype (H1N1)
HAPA	Health Action Process Approach
HCWs	Health Care Workers
HIV	Human Immunodeficiency Virus
KABs	Knowledge Attitudes and Beliefs
MMR	Mumps Measles and Rubella
NACI	Canadian National Advisory Committee on Influenza
PASW	Predictive Analytics Software
PBC	Perceived Behavioural Control
PCA	Principal Components Analysis
PHAC	Public Health Agency of Canada
SHEA	Society for Healthcare Epidemiology of America
SMEs	Subject Matter Experts
SMU	Saint Mary's University
SPSS	Statistical Package for the Social Sciences
TPB	Theory of Planned Behaviour
TTM	Transtheoretical Model

CHAPTER 1: INTRODUCTION

Recent events such as the 2009 H1N1 influenza pandemic have demonstrated that influenza (the flu) can still have significant detrimental consequences for individuals, organizations and societies at large. From an organizational effectiveness and job productivity perspective, statistical data suggest that the 2009 H1N1 pandemic cost Canadian organizations approximately 1.5 million absences (9% of all working adults from 15-69 called in sick due to H1N1 illness) and 20.9 million lost work hours in the month of November in 2009 (Statistics Canada, Labour Force Survey, 2009). Societal consequences including deaths of otherwise healthy adults have highlighted the need to vaccinate as many individuals as possible to prevent not only the infection of the individual, but also the unintended infection of others. Although the recent H1N1 pandemic is different in nature than seasonal influenza epidemics, it is important to understand which factors influence the uptake of seasonal influenza vaccination across numerous populations. Evidence gathered from seasonal influenza campaigns can be included with programs and policies in the advent of a pandemic.

According to the Public Health Agency of Canada (PHAC), an estimated 10-25% of Canadians contract seasonal influenza each year (Health Canada, 2011). For the most part, those infected will recover completely from all associated symptoms, however, an estimated 20,000 hospitalizations and 2,000 to 8,000 deaths are attributed to the complications of influenza each year in Canada (Public Health Agency of Canada, 2011). Although influenza has the greatest impact on the health and well-being of the elderly, individuals with chronic conditions, or those with compromised immune systems, it is

also important for Health Care Workers (HCWs) to be immunized against influenza. HCWs are not necessarily at increased risk for complications associated with the influenza virus; however, the possibility of transferring the influenza virus to the aforementioned at-risk groups is of great concern. Moreover, HCWs are at a higher risk of exposure to influenza as they are exposed in both the community and in the workplace (Hofmann, Ferracin, Marsh, & Dumas, 2006). Based on this reality, the Canadian National Advisory Committee on Immunization (NACI) recommends that influenza immunization programs strive to immunize at least 90% of eligible HCWs (NACI, 2006). In fact, NACI regards influenza immunization of HCWs with direct patient contact as an essential component of the standard of care for the protection of patients. Refusal of seasonal influenza vaccine by HCWs, without contraindications, is viewed as a failure in their duty of care to patients (NACI, 2006).

Based on the aforementioned recommendations and evidence to support immunizing HCWs, there have been concerted efforts to vaccinate the health care worker segment of the “healthy” population (NACI, 2008). Specifically, Canadian HCWs are offered a publicly funded influenza vaccine at the beginning of each influenza season by their employers. Although influenza immunization for health care workers is offered at no cost to the individual, the overall acceptance of the vaccination is low. In Canada, results of questionnaire studies suggest that only 37% of Emergency Department (ED) personnel from four teaching hospitals (Saluja, Theakston, & Kaczorowski, 2005) and a median proportion of 29% of HCWs from a cross section of Alberta nursing homes (Russell, 2001) received a seasonal influenza vaccination in their annual vaccination

campaigns. More recent data suggests that the vaccine coverage rates among HCWs in Canada range from 26-61% (NACI, 2006) while in the US only 38% of HCWs were immunized in 2002 (Harper, Fukuda, Uyeki, Cox , Bridges). Overall, these low acceptance rates are surprising considering the Canadian National Advisory Committee on Immunization (NACI) recommendation of having 90% of eligible HCWs vaccinated and the evidence that supports the effectiveness of influenza vaccination (Naus, Deeks, Dobson, Duval, Embree, et al. 2006).

Effectiveness of Seasonal Influenza Vaccine within a HCW Population

When reviewing the available literature it is apparent that vaccinating HCWs against seasonal influenza is efficacious. According to PHAC there are numerous precursors that determine how effective influenza vaccine is each year. For the most part, age, immunocompetence of the recipient, the type of influenza infection and the match between vaccine and vaccine strain are the key factors necessary to have an efficient influenza vaccine. With a good degree of similarity (match), influenza vaccine has been shown to reduce influenza illness in 70% - 90% of healthy individuals (Naus, Deeks, Dobson, Duval, Embree, et al. 2006). Within the healthy working adult segment of the population, influenza vaccine has also been shown to be effective. Vaccination against seasonal influenza virus reduced total days of illness, reduced the total amount of workdays lost, and reduced health care visits in a notable randomized control trial (Nicol, Mendelman, Mallon, Jackson, Gorse, Belshe, Glezen, & Wittes 1999). The effectiveness of influenza vaccine has also been investigated within populations that operate within the

healthcare system. In their 1999 randomized, double blind trial, Wilde, McMillan, Serwint, Butta, O’Riordan, & Steinhoff concluded that vaccination was effective at reducing infection by influenza. Reported illness was 28.7 days per 100 participants for HCWs that received an influenza vaccination and 40.6 days per 100 participants for HCWs that did not receive an influenza vaccination.

Seasonal Influenza Vaccine and Associated Organizational Outcomes

According to the Canadian Coalition for Immunization Awareness and Promotion (CCIAP), workplace immunization clinics are becoming a popular method to protect employees against influenza infection. Immunization of the working public can reduce absenteeism, replacement & overtime costs, lost productivity, employer health costs and costs associated with the rescheduling of work related events (CCIAP, 2011).

Additionally, there is a growing body of literature that has shown healthy working adults can benefit from annual influenza vaccination. Nicol et al. (1995) reported a significant difference between placebo and vaccine groups when measuring absenteeism due to upper respiratory illness. The participants that received a vaccination reported 43% fewer days of sick leave from work due to upper respiratory illness. This result translated in a total savings of \$46.85 per person vaccinated. Similarly, Wilde et al. (1999) reported a significant reduction in overall work related absence for HCWs that received influenza vaccine (9.9 days per 100 participants vs. 21.1 per 100 participants). This reduction in lost work days significantly reduced costs associated with overtime and replacement workers. Based on the aforementioned research findings it does appear that organizations would benefit from having their staff vaccinated against the influenza virus.

Patient Safety

Although organizational outcomes are important, some would argue that there are more critical reasons for vaccinating HCWs against seasonal influenza. It is generally accepted that influenza can be transmitted in healthcare settings from visitor-to-patient, from patient-to-patient, from patient-to-HCW, and from HCW-to patient (Talbot, Bradley, Cosgrove, Ruef, Siegel, & Weber, 2005). It is the later possibility of transmission that is worrisome from a patient safety perspective. If infected with influenza virus, HCWs can spread infection throughout an entire health care facility. Although there has been little investigation into the association between influenza vaccination and overall mortality rates in health care institutions, there are some indications that patient safety is influenced by HCWs decision to accept or reject an annual influenza vaccine. For example, the Society for Healthcare Epidemiology of America (SHEA) reported that mortality rates were significantly higher in geriatric long care institutions where HCWs were not vaccinated against influenza illness. In two separate studies, SHEA highlighted a significant increase in mortality (17% vs. 10% and 22% vs. 14%) in institutions where an influenza vaccine program was not offered (Talbot, Bradley, Cosgrove, Ruef, Siegel, & Weber, 2005). Other research has found that influenza vaccination for HCWs has reduced patient mortality in long-term care facilities (Carmen, Elder, Wallace, McAulay Walker, et al., 2000). Furthermore, previous research has suggested that there is a decrease in patient safety associated with nosocomial infection when HCWs are not vaccinated against seasonal influenza (Potter et al, 1997, Harper, Fukuda, Uyeki, Cox, & Bridges 2004). As mentioned previously, there is an

unacceptably low adherence rate for influenza vaccination programs among HCWs. It is possible that these low adherence rates could have decreased overall patient safety within the facilities investigated by increasing exposure to influenza virus among a patient population.

Based on the aforementioned research studies, it is apparent that annual influenza vaccination is an effective method for reducing the overall incidence of illness associated with the influenza virus. Despite the proven effectiveness of influenza vaccination and recommendations from NACI, health care centres in Canada still struggle to achieve adequate seasonal influenza vaccine coverage among HCWs.

Although there is no single driver or barrier for refusal of seasonal influenza vaccine among HCWs, researchers are beginning to understand and identify some of the key requirements for successful seasonal influenza vaccination campaigns. Evidence suggests that the decision to accept influenza vaccine is difficult for individuals working in and around the healthcare industry (Sullivan, Pierrynowski-Gallant, Chambers, O'Connor, Bowman et al., 2008). Barriers for vaccine uptake among a HCW population include, but are not limited to, a perceived lack of vaccine efficacy (Hofmann, Ferracin, Marsh, & Dumas, 2006), lack of convenience (Ohrt, & McKinney, 1992), and fear of adverse events (Habib, Rishpon, & Rubin, 2000). Since the decision to accept seasonal influenza vaccine is a difficult one, and one that could be influenced by a number of factors, experts have advocated for the use of multi-faceted intervention strategies to increase HCWs uptake of seasonal influenza vaccine (Ajeno, Woeltje, Babcock, Gemeinhart & Jones, 2010). Based on a comprehensive review of the literature, examples

of intervention strategies to increase HCWs uptake of seasonal influenza vaccine include, but are not limited to, free vaccine, mobile vaccination carts, promotional and educational campaigns (Pearson, Bridges & Harper, 2006, Nowalk, Lin, Zimmerman, Fox, Raymond, Tanis, Harper, & Willis, 2008, Ballestas, McEvoy & Doyle, 2009). More recently, a ten year review by Ajeno, Woeltje, Babcock, Gemeinhart & Jones (2010) suggested that interventions which used a *signed declination*¹ process and a *balanced scorecard*² approach were more effective at increasing seasonal influenza vaccine uptake among HCWs. Interventions which used only an education session as the intervention were perceived as less useful in post-intervention follow-up (Ajeno, Woeltje, Babcock, Gemeinhart & Jones, 2010). Although it is apparent that a number of targeted interventions have been conducted with the goal of increasing seasonal influenza vaccine uptake of HCWs, few of these interventions have used established, evidence based strategies.

In order to increase healthy behaviours such as vaccine acceptance it is important to design relevant interventions that use an evidence-based approach. For example, one might expect an intervention to be successful if it is specifically tailored to a targeted population or a common deficiency within a given population (i.e., lack of education regarding influenza vaccine, accessibility concerns with vaccine delivery). Although designing interventions using an evidence-based approach seems to be a logical strategy,

¹ A signed declination is utilized when a HCW chooses not to accept a seasonal influenza vaccination after receiving standard information from the occupational health department. HCWs are requested to sign the declination form acknowledging that they have received sufficient information about the influenza vaccine, its risks and benefits, and the potential risks associated with not receiving the vaccine.

² A balanced score card is a feedback instrument that provides leadership in organizations a report to determine if they are achieving predetermined goals. Seasonal influenza vaccine uptake among staff would be one metric that is assessed in the healthcare organization.

there is a growing recognition that the majority of health related behavioural change interventions are not grounded in evidence based research or supported by theoretical frameworks (Lippke & Ziegelmann, 2008). For example, Evers, Prochaska, Driskell, Cummins, Prochaska, and Velicer (2003) discovered that 76% of the 37 online health related behavioural change interventions they investigated did not incorporate a theoretical model in their design. More recently, a review of behavioural change interventions suggests that over half (54%) are not grounded in a theoretical framework (Dombrowski, Sniehotta, Avenel, and Coyne, 2007). Based on this reality, researchers have called for an increased emphasis on theoretical models when designing health-related behavioural change interventions (Nigg, Borrelli, Maddock & Dishman, 2008, Lippke & Ziegelmann, 2008). The use of scientifically validated theoretical models when designing health-related data collection instruments and interventions will result in a greater understanding of processes, increased knowledge and a wealth of accumulated knowledge (Lippke, & Ziegelmann, 2008).

CHAPTER 2: Secondary Literature Review

Understanding and Predicting Behavioural Change: The Influence of Psychosocial Predictors on Health Related Behaviours

When reviewing the available behaviour change theories from the field of psychology, it is clear that many theories exist that attempt to explain and understand human health related behaviour. From a very broad perspective these theories can be divided into two groupings (1) continuum models and (2) stage models (Weinstein, Rothman, & Sutton, 1998).³ The next section is presented as a high-level overview of continuum and stage models of behaviour change.

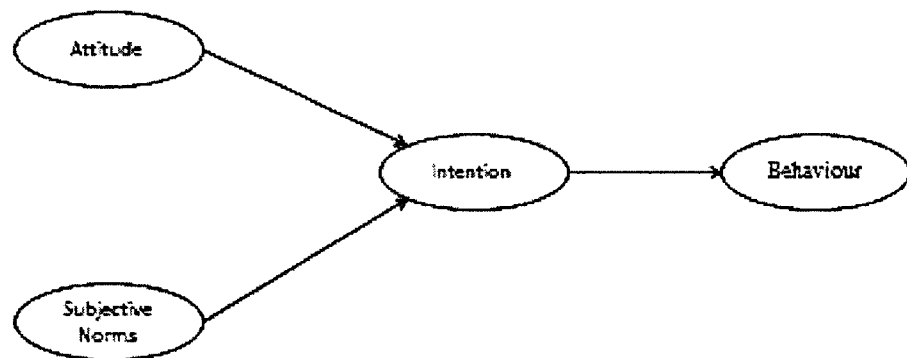
Continuum models

Continuum models attempt to highlight predictors for health behaviour change (e.g., attitudes, past behaviour). Typically, continuum theories use a combination of all variables in the model to predict an individual's likelihood of behaviour (or behaviour change). If, for example, an individual's attitude toward the behaviour increases it is expected that the likelihood of that behaviour being performed will also increase. In this manner, a continuum model uses a linear prediction equation; as one predictor increases (e.g., attitude toward behaviour becomes positive) so does the likelihood of that behaviour (or behaviour change) (Sutton, 2008). Examples of continuum models include the Theory of Reasoned Action and Theory of Planned Behaviour (Fishbein & Ajzen 1975, Ajzen, 1985).

³ It is beyond the scope of the current review to engage in a full review of continuum and stage models; however it is important to briefly overview some of the more popular theories/models used to predict or understand health-related behaviours.

The Theory of Reasoned Action (TRA) is a social psychological framework that considers behavioural intention to be predictive of any voluntary behaviour (Fishbein & Ajzen 1975). According to the TRA, behavioural intention is influenced, or predicted, by two key factors, (1) an individual's attitude toward the behaviour and (2) subjective norms. In this context, attitudes are a combination of beliefs and evaluations regarding the behaviour. For example, if one believes that the seasonal influenza vaccine is effective and it prevents illness, they will likely have a positive attitude toward seasonal influenza vaccine. Subjective norms are representations of the impact of individuals in one's social environment. For example, if co-workers believe you should accept a seasonal influenza vaccine as a HCW, and you value your co-workers opinion, the TRA would expect this influence to impact uptake of seasonal influenza vaccination positively (Fishbein & Ajzen 1975). Figure 1 is a graphic representation of the TRA.

Figure 1: Theory of Reasoned Action



The Theory of Planned Behaviour (TPB) considers behaviour intention to be influenced by three distinct constructs: attitude, subjective norm and perceived behavioural control.⁴

Attitude is the perception of the favourable or unfavourable consequences of engaging in certain behaviour (Ajzen, 1991). For example, an individual may consider the act of receiving influenza vaccine a positive activity as it will reduce the risk of becoming ill. Conversely, another individual may consider the act of receiving a flu shot

⁴ The theory of planned behaviour is a revision to the theory of reasoned action (Fishbein & Ajzen, 1975).

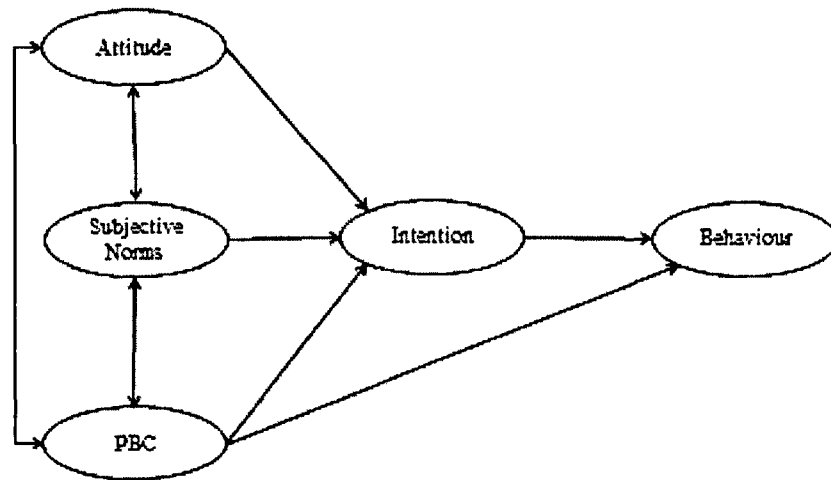
to be unpleasant due to the physical discomfort involved. Individual attitudes often vary across a sample of individuals and should be examined thoroughly.

Perceived behavioural control is based on the individual's perception of internal resources necessary to complete a given task (Ajzen, 1991). For example, if an individual does not think that they are able to be vaccinated against influenza due to time constraints they are highly unlikely to participate in that behaviour.

Subjective Norm is comprised of the normative influence to motivate individuals to behave in certain ways (Ajzen, 1991). If for instance an individual's significant other believes that it is important to receive an annual influenza vaccination, and the target individual values the opinion of their significant other, the target individual is more likely to adopt the behaviour of the norm influence⁵. Figure 2 is a graphic representation of the TPB model.

⁵ For a further explanation of the constructs associated with the TPB see Ajzen, 1991 or visit <http://www-unix.oit.umass.edu/~ajzen/> to view various interventions based on the TPB.

Figure 2: Theory of Planned Behaviour



Stage models

In contrast, stage models consider behaviour change to occur in a number of discrete phases. For example, the Transtheoretical Model (TTM) classifies individuals according to their readiness for change which includes Pre-contemplation (PC), Contemplation (C), Preparation (PR), Action (A), and Maintenance (M) (Di-Clemente, Prochaska, Fairhurst, Velicer, Rossi, & Velasquez, 1991). Within this model, individuals vary in their intention to perform a behaviour from immediately to up to up to 6 months (Prochaska, Wright, & Velicer, 2008). Similarly, the Health Action Process Approach

(HAPA) (Schwarzer, 1992, 2008) is a social-cognitive stage model of health behaviour change. The HAPA considers health behaviour and behaviour change to consist of two key stages which include, (1) a motivational phase and (2) a volitional phase. In the motivational phase of the HAPA an individual is contemplating or considering behaviour regarding a health outcome (i.e., engaging in physical activity) or altering risky behaviours (i.e., smoking cessation). The volitional phase includes the processes involved with the actual implementation of intention into behaviours. The key concepts included in the volitional phase include initiation, maintenance and recovery (Schwarzer, 2008). Previous research using the HAPA has supported the appropriateness of this model when attempting to increase health behaviours.

Although the HAPA and TTM appear to have support for being well-designed parsimonious models, the perceived problem for using a stage theory in the current research is that the outcome variable (vaccine uptake) is not a behaviour that is frequent in nature. For example, with a health related behaviour such as physical activity an individual has a prolonged opportunity to continue the motivational and volitional elements, while the decision to accept flu vaccine or not is an immediate one and is usually one-off. Previous research (Conner & Norman, 2005) has supported the use of stage models (i.e., HAPA) for behaviours that are dependent on a maintenance phase (e.g., healthy eating, physical activity) but not for behaviours that are temporary in nature (vaccine uptake). Table 1 presents trends of health related theories and models over a twenty year period from 1986-2005 (Glanz, Rimer & Viswanath, 2008).

Table 1: Sample of health behaviour theories and models from 1986-2005⁶

Theory/Model	1986-1989 (51)	1992-1994 (66)	1999-2000 (N/A)	2000-2005 (55)
Health Belief Model	✓	✓	✓	✓
Social Learning Theory				
Social Cognitive Theory	✓	✓	✓	✓
Theory of Reasoned Action				
Theory of Planned Behaviour	✓	✓	✓	✓
The Transtheoretical Model		✓	✓	✓
Social Support and Social Networks		✓	✓	✓
Community Organization		✓	✓	
Social Marketing		✓		✓
Diffusion of Innovations		✓	✓	✓
Stress and Coping		✓	✓	✓
Patient-Provider Interaction		✓	✓	
Ecological Models/Social Ecology			✓	✓

Note.

Number of identified theories for associated period is contained within parentheses.

N/A denotes total not available for that period.

✓ denotes theory or model used to explain health behaviours during associated period.

⁶ Table re-created based on work of Glanz, Rimer & Viswanath (2008).

One challenge when reviewing the available psychological theories is deciding which theory to incorporate when attempting to impact seasonal influenza vaccine uptake. First, the overall validity and adequacy of the theory is a concern. Although behaviour change theories do exist that are capable of explaining behaviours, one must also be cognizant of the context in which the behaviour occurs. Accepting that a theory is supported in one context (i.e., explaining physical activity) does not ensure that the theory will generalize to other behaviours (i.e., vaccine acceptance). Second, although the theory may be adequate when explaining human behaviour, researchers must also consider how parsimonious the theory is (i.e., can a less complex theory explain or predict behaviour change at similar (or increased) levels to a more complex theory?). The issue of parsimony has important considerations not only for researchers in the area of vaccine uptake, but for practitioners and clinicians attempting to increase influenza vaccine uptake as well. For example, if a more parsimonious theory exists to predict influenza vaccine uptake, than it would make practical sense to incorporate interventions and strategies that focus on the more parsimonious model as one would have less individual level variables to alter or maintain. Also, with the ever decreasing opportunity to engage staff members in the healthcare field due to time and resource constraints, it makes practical and intuitive sense to create interventions that require the minimum amount of organizational sponsored time. Aside from the practical considerations listed above, a number of strategic reflections are required before a choice is made with respect to which theoretical model is utilized to predict seasonal influenza vaccine uptake among HCWs.

According to Glanz & Bishop (2010), the selection of an appropriate theoretical model for health-related interventions should also be based on a number of criteria including the (1) identification of the problem, (2) the context, and (3) the ultimate research goal. After careful assessment of the previously mentioned theoretical models (including both continuum and stage theories), consideration of the current problem (low uptake of seasonal influenza vaccine by HCWs), the context (influencing individual behaviour in an organization), parsimony, and the goal (understanding the psychosocial predictors of seasonal influenza vaccine uptake), it is recommended that the Theory of Planned Behaviour (TPB) (Ajzen, 1985) be considered when designing future interventions to increase seasonal influenza vaccine among a HCW population.

A review of the available research reveals that there is limited research that has utilized a TPB framework to predict intentions to receive seasonal influenza vaccination. Gallagher & Povey (2006) tested an extended TPB model which included past behaviour and feelings of regret as additional predictors of intention to receive influenza vaccine in an elderly adult population. Results of this study supported the use of an extended TPB model accounting for 48% of intention to receive influenza vaccine (Gallagher & Povey, 2006). Although this study did support the use of the TPB as a theoretical framework to predict intentions to receive influenza vaccination, Gallagher & Povey (2006) did not test the appropriateness of the TPB on a HCW population, nor did they design an intervention based on the TPB. Additionally, Nowalk et al. (2008) used the Theory of Reasoned Action to construct survey items related to HCWs perceptions of vaccine effectiveness, but did not conduct any validation study to assess the appropriateness of the TRA items

as significant predictors of seasonal influenza vaccine uptake among a HCW population. If one is interested improving seasonal influenza vaccine uptake among HCWs using the TPB framework, it is important to design an intervention that incorporates elements of the TPB (i.e., attitude, subjective norms and PBC) in its design. Thus, Study 1 was designed.

CHAPTER 3: Study 1

Overview and Goals

Previous research suggests that there have been few attempts to use empirical, evidence based rationales when designing interventions to increase seasonal influenza vaccine uptake among a HCW population. The purpose of Study 1 was to increase seasonal influenza vaccine uptake among a HCW population using a workplace intervention grounded in established social psychological theory. Specifically, the intervention created for this study was based on the TPB framework and includes various strategies to impact seasonal influenza vaccine uptake of HCWs by targeting predictors of intentions and subsequent behaviour (see Table 2). To achieve this goal, an intervention was designed that utilized peer vaccine champions to promote vaccine. It was hypothesized that a peer champion would increase delivery of information regarding the evaluative and belief based assumptions of seasonal influenza vaccine (attitudes), highlight internal and external control realities of the seasonal influenza vaccination campaign (PBC) and motivate/persuade co-workers via peer influence (subjective norms).

Development of a TPB Based Intervention: Increasing Vaccine Uptake Through Peer Vaccine Champions

The peer vaccine champion intervention was designed to elicit all three elements of the TPB using one strategy. To achieve this goal, the peer vaccine champion would be required to impact (1) attitudes, (2) subjective norms, and (3) PBC.

Attitudes: Champions were expected to impact attitudes by promoting seasonal influenza vaccination, discussing the positive outcomes of receiving a vaccination (e.g., less sick time, protecting patients) and educating co-workers with respect to the effectiveness of seasonal influenza vaccine. This strategy was expected to target attitudes directly through the evaluative and belief based elements of HCWs global attitudes toward seasonal influenza vaccine.

Subjective Norms: Since previous research (Rogers, 1985), suggests employees are more likely to be persuaded by individuals that hold a similar position in the organization, peers (co-workers) were trained as vaccine champions. Supporting this view, previous research has shown that direct persuasion tactics that use authority figures or rewards as methods to promote acceptance of a change program are not effective (Larkin & Larkin, 1996). In contrast, programs that used co-workers or peers as sources of influence were able to promote successful change in a variety of contexts including safer sex campaigns (Kelly, Lawrence, Diaz, & Stevenson, 1991), urinary catheter care (Seto, Chin, Yuen, Chu, & Seto, 1991), service delivery (Lam & Schaubroeck, 1991), and stroke assessment (Hamilton, McLaren, & Mulhall, 2006).

PBC: Previous research by Francis et al. (2004) has suggested that there are internal (self-efficacy) and external (controllability) aspects of PBC; therefore two approaches were utilized to impact PBC. First, all HCWs that were exposed to a peer vaccine champion were advised that the seasonal influenza vaccination was not mandatory and that they had the right to refuse vaccination. Second, champions were able to administer the vaccination to their co-workers on site. This strategy was expected to

increase accessibility and proximity to the seasonal influenza vaccine and therefore reduce organizational related barriers as described earlier. Table 2 presents the sub-elements of the peer vaccine champion intervention.

Table 2: TPB elements within the peer vaccine champion intervention

TPB Element	Champion Process
Attitude	Champions promoted seasonal influenza vaccine by highlighting the importance of accepting vaccine, highlighting the effectiveness of the vaccine and dispelling myths associated with receiving a seasonal influenza vaccination (e.g., a seasonal influenza vaccine can give you the flu).
Subjective Norms	The champion process was designed to motivate HCWs to accept seasonal influenza vaccine through peer influence of co-workers. A deliberate effort was made to use an individual from a similar position within the organization to avoid the negative implications associated with using a manager or supervisor (e.g., perceived manipulation).
Perceived Behavioural Control	<p>External control (organization): Increasing the access to seasonal influenza vaccination by including a peer vaccinator within pre-identified units was expected to improve vaccine uptake.</p> <p>Internal control (self-efficacy): Peer champions informed all potential recipients of seasonal influenza vaccine that the decision to accept/reject vaccine was ultimately up to them.</p>

Hypothesis 1: Groups where a champion is present will have significantly higher levels of influenza vaccination uptake than the groups where no champion is present.

Methodology

The participating healthcare facility in Study 1 is a large acute care facility located in Eastern Canada. At this organization, there has been a concerted effort to increase the acceptance rate of the flu vaccine among staff. Although the healthcare centre has set a target vaccination rate of 70% of all employees, from 2000 to 2004 the vaccination rates were between 38% and 42% (McCallum, 2006). For the most part this healthcare organization has focused on increasing the influenza vaccination rates by implementing information-based campaigns that highlight the importance of receiving a flu shot and consequences of acquiring influenza. This approach is consistent with other healthcare organizations that have typically utilized print materials to deliver information about seasonal influenza vaccination (i.e., informative posters). Although this method is useful in explaining why it is important to receive an annual vaccination, previous research has shown that this method may not be ideal when attempting to influence attitude or behaviour change (Cialdini, Reno, & Kallgren, 1990, Schwarz, Sanna, Skurnik, & Yoon, 2007). With respect to seasonal influenza vaccine specifically, previous research (Ajenjo, et al. 2010) suggests that participation in education campaigns does not always translate into vaccine acceptance. Thus, the decision was made to promote seasonal influenza vaccine by incorporating a process that utilized multiple strategies including provision of seasonal influenza vaccine information, increased accessibility and social or peer influence via a vaccination champion during the 2005 seasonal influenza campaign.

Identification of Champions

Forty-six work units, matched for size of unit, organizational function (e.g. surgery, administrative, intensive care unit), and previous year's immunization rate were selected from the larger organization for participation in the project in 2005. These 46 units were randomly assigned to one of two conditions (champion present vs. control; $N = 23$ work units each). In the groups assigned to the champion conditions, managers were contacted by the department of organizational health and asked to select one individual who could be trained as a vaccination "champion" (see Appendix A). It was communicated to the department heads that these individuals did not have to be in a position of authority. Rather, they were asked to select individuals that operated in a front-line capacity and were well liked by co-workers. Additionally, managers were asked to choose an individual that they viewed as a leader, that was trusted by co-workers and was committed to follow through on the study and promote and encourage co-workers to accept influenza immunization. The proposed champions were also to be someone who accepted the influenza immunization yearly themselves. Managers were required to support the champion process by allowing the unit champion to attend an all-day training session prior to influenza season.

Based on the existing research which supports co-workers or peers as leaders of change, unit managers selected individuals who were at a similar position socially to their co-workers in their respective work units to act as champions. Using individuals from a similar position in the organization hierarchy to promote influenza vaccination was also expected to influence the normative nature (duty of care and commonality) of influenza

vaccination versus using a traditional knowledge-based approach. Peer vaccine champions were responsible for encouraging and motivating members of their work units to accept a seasonal influenza vaccination.

Prior to, and during this intervention, immunization rates were tracked using the facility's existing tracking system, which has monitored flu immunization rates for several years. Individuals identified by the unit managers were then trained by an Occupational Health Nurse.

Champion Training

Through the healthcare organization's Occupational Health Department, the research team was able to train the pre-selected peer champions. The training consisted of a one-day educational session on the influenza virus, the importance of HCW influenza immunization, common misbeliefs about influenza immunization and, where appropriate, training in the administration of influenza vaccine. Presentations from various health professionals regarding the importance of vaccine compliance were also included in the full-day training session. In addition, each champion was provided with supporting literature which included (1) an introduction, (2) occupational health pledge of confidentiality, (3) learning module for the delivery of influenza vaccine, (4) learning module for the treatment of adverse events and anaphylaxis, (5) influenza learning module, (6) various pieces of literature provided by Department of Health and Wellness-Public Health, (7) influenza immunization clinics schedule, (8) consent form for administration of the vaccine, and (9) post training assessment. A more detailed explanation of the champion training elements can be located in Appendix B. Although

23 champions were invited to attend the training sessions, only 13 champions were present for the full day course. The individuals that did not attend the champion training were provided with the identical supporting literature as those whom attended the full day session.

Results

Data Analysis

A total of 46 work units (23 units where a champion was present, 23 units where a champion was absent) were randomly assigned and selected for participation in the study. Post-intervention analyses were conducted using a series of two-tailed independent samples t-tests in Statistical Package for the Social Sciences (SPSS) version 15.0. The independent samples t-test revealed a significant difference between the championed and non-championed groups ($t(22) = 2.86, p < .03$). Group comparisons revealed that the percentage of individuals who received an influenza vaccine in the champion absent condition was 41% whereas in the champion present group, compliance was significantly higher at 52%, (95% confidence interval for increase 2.9%-18.2%) (Hypothesis 1 supported).

To control for possible group effects the data were also compared by year using a series of paired sample t-tests. Using archival data collected internally from the participating facility, we were able to determine whether there was a significant increase from the previous year's vaccination rates for both the championed and un-championed groups. In groups where a champion was present the vaccination rate increased from 44%

to 54% in ($t(21) = 4.38, p < .001$) or a 10% increase (95% Confidence Interval for increase 4.8%-13.6%). For groups where no champion was present, the overall vaccination percentage increased slightly (38% to 41%), but this change was not significant ($t(21) = 1.16, p = .25$).

Secondary Data Analysis

Although an initial sample of 23 matched work units was used and champions were identified in all work units, not all of the identified champions actually attended the training sessions. Fortunately, we were able to identify the units where champions were identified, but no face to face training took place. When we excluded these ten units from further analysis, the vaccination percentage increase for the championed groups remained (41% in the non-championed group and 54% in the championed group) however the relevant t-test did not reach accepted levels of significance ($t(24) = 1.79, p = .08$, two-tailed). The change in significance without any change in percentage difference suggests this is simply an issue of statistical power. Results for each individual work unit are presented in Figures 3 and 4.

Figure 3: Influenza vaccination rates in experimental and control condition (N = 23 matched pairs)

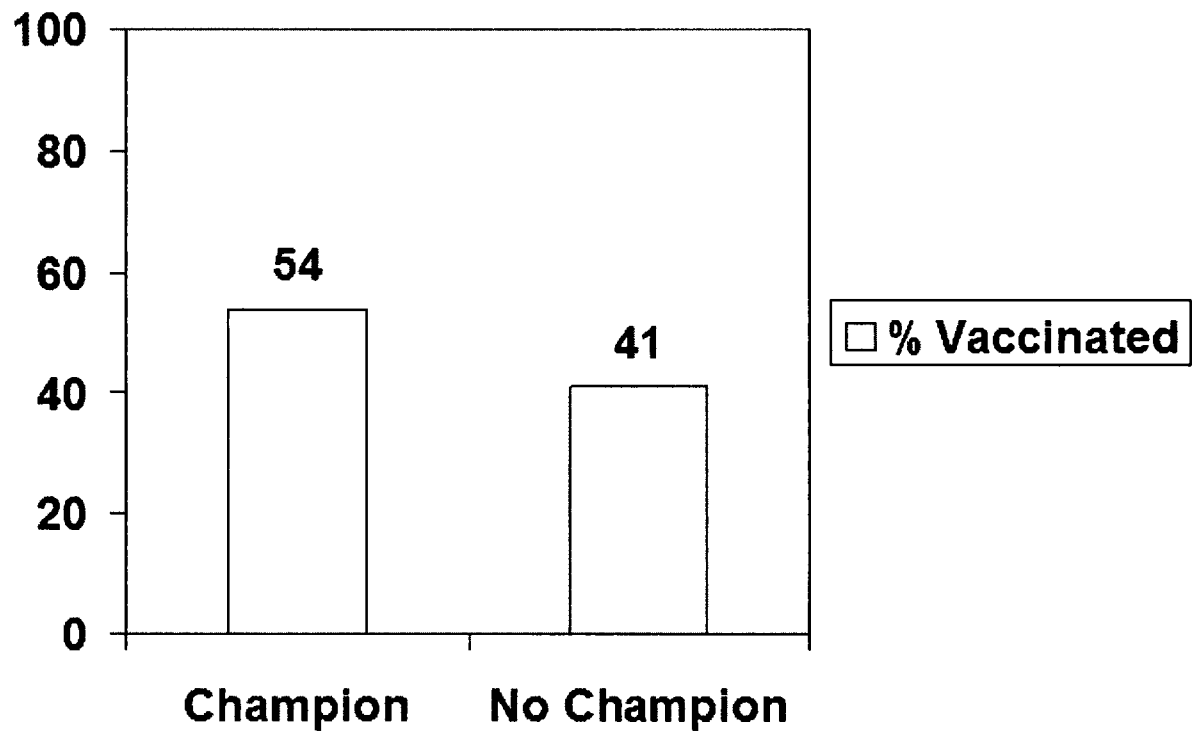
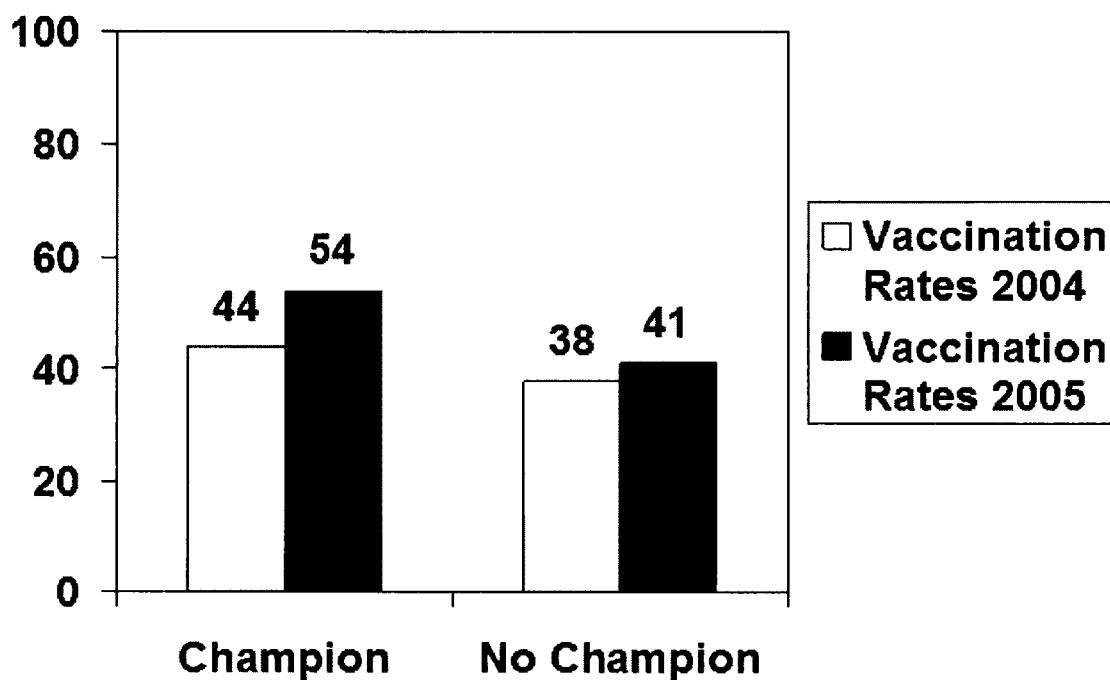


Figure 4: *Influenza vaccination rates for 2004 and 2005 (N = 23 matched pairs)*



To determine if there were any significant differences in seasonal influenza vaccine uptake among the units where the champions attended the full day face to face training versus those champions that only received the information binder, an independent sample t-test was performed treating units in which the champion attended the full day face to face session as one group and those units in which the champion only received the educational materials in binder form as the second group. Results of the t-test analysis suggest no significant differences between the two groups. Specifically, the percentage of vaccine uptake for the units where the champion attended the face to face

training was 53.3% versus 51.5% in the group that only received the education materials via printed copies ($t(21) = .31$, *ns*, two-tailed).

Discussion

The results of Study 1 were very promising and offered support for the use of an intervention based on the TPB when attempting to increase the rates of HCW seasonal influenza vaccination in a hospital based setting. For the 23-unit sample, vaccination rates increased significantly as compared with units without champions and also as compared with previous years on the same unit.

It is intriguing to consider why the presence of a unit champion influenced vaccine uptake. Through anecdotal reports, the occupational health and safety manager suggested that many of the vaccinated employees cited convenience of the process as a driving force. Although convenience or accessibility could have been a driving factor; this data was not collected formally. Another possible driving factor is the increased knowledge provided by the champion themselves. For example, if an individual had concerns with respect to the safety or effectiveness of the vaccine, they could simply ask the champion. In addition, the champion provided unsolicited vaccine information to potential recruits which could have impacted the evaluative component of the attitude factor. Finally and perhaps most importantly, is the peer influence during this process. Individuals from similar units were responsible to promote and deliver vaccine (in some cases). Previous research has demonstrated a strong effect of normative influences when attempting to influence human behaviour (Ajzen, 1985, Rogers, 1985, Cialdini, Reno, & Kallgren, 1990). Through anecdotal reports, there was also information provided which

aids in explaining the impact of peer influence from the anti-seasonal influenza vaccine side of the debate. It was very interesting to hear firsthand accounts of traumatic events that occurred fifteen to twenty years ago following a seasonal influenza vaccination. These stories lived on in nursing units and offer some qualitative evidence that what co-workers say matters.

Although there was a significant increase in influenza vaccinations for the championed group, there was still approximately 46% of staff that refused an annual influenza vaccination. Although a very small minority of these individuals may be refusing influenza vaccinations for legitimate reasons (e.g., contraindications, allergies) there are still a number of unanswered questions with respect to non-compliance. One possible approach to understanding these low compliance rates is to target the psychological drivers that are associated with vaccine refusal. Although there have been some efforts to understand Knowledge Attitudes and Beliefs (KABs) surrounding vaccine acceptance there have been very few research studies that incorporate proven psychological theory in their design. Furthermore, considering the aforementioned factors for success in this intervention (education, normative influences and accessibility), it makes logical sense to explore these motivators more thoroughly via questionnaire or survey methodologies.

It is clear that having an assigned champion in a work unit can influence vaccination rates. What is less clear is which factors contribute to a successful champion campaign. Perhaps simply identifying a champion would be sufficient to obtain the desired results. Future research is required to explore this possibility.

Limitations

As previously described, the attendance at the champion training sessions was quite low. Of the 23 selected champions only 13 attended champion training. This low attendance rate introduces two possible issues with the current study. First, the low attendance rate dropped the number of groups available for statistical analysis and the ability to detect an effect due to a reduction in statistical power. Second, it is possible that the unit managers representing the 10 champions that did not attend the champion training did not support the champion process. That said, untrained champions still promoted the influenza vaccination campaign within their respective units even though they were not trained in how to administer the vaccination. This suggests directions for future research; perhaps training is not necessary to increase vaccination rates and simply identifying an appropriate champion and providing them with promotional materials is sufficient. Another possible limitation of this research could be related to the manner in which the champions were selected. Unit managers were solely responsible for identifying the champion from their group and it is possible that certain inherent biases such as selecting a champion based on the manager's personal experiences were present in this process. Although it is important to consider the impact of personal biases in the selection of the champion, it is important to note that if a champion was selected based on favouritism from a manager; it is likely that the impact of the champion would have been diminished if the work unit was aware of that bias. Using a purer form of champion selection (i.e., opinion leadership) where the champion is selected anonymously from the

members of the unit would hypothetically lead to a more effective champion process. Therefore, engaging the front-line in the champion selection process is recommended.

Finally, although the TPB seems to be an appropriate framework to ground a champion process in, there are other potential drivers to seasonal vaccine uptake. For example, one would expect morality or knowledge of co-worker vaccine status to be a driver in addition to the traditional TPB variables (attitudes, subjective norms and PBC). In this study there was no formal evaluation post intervention. A logical assumption is that the champion intervention is a combination of accessibility, information and peer influence, however it is important to determine if other predictors are important when attempting to increase seasonal influenza vaccination among HCWs. Understanding which elements of the TPB are most important for the success of the champion process is now required.

Future Research

Future research could employ tactics and models from other areas of social psychology and social marketing which have proven effective in altering human behaviour. Examples could include the Focus Theory of Normative Conduct (FTNC) (Cialdini, Reno, & Kallgren, 1990), the Elaboration Likelihood Model (ELM) (Petty, Cacioppo, 1986), and the Health Action Process Approach (HAPA) (Schwarzer, 1992).

Future research could also train unit champions in tactics that assist in persuading the “non-compliers”. In Study 1 the unit champions were provided information on influenza and influenza immunization, as well as, vaccination training (if appropriate), however, they were not specifically trained in how to encourage individuals to accept a

vaccination other than providing information regarding the positive outcomes associated with seasonal influenza vaccination. Training interventions could be designed that target the actual barriers and drivers of influenza vaccination acceptance among HCWs. For example, if research indicates that fear of adverse reactions is a barrier for seasonal vaccine uptake, researchers and practitioners could design counter-arguments that clearly inform HCWs of the real risk of adverse reactions. The selection of the unit champions could also be conducted democratically, but still using the selection criteria (e.g., a trusted co-worker), by co-workers to avoid possible biases with this process which could originate with clinical or unit managers.

Finally, systematic research could be undertaken in order to understand which elements of the champion process are necessary to influence a significant change in vaccination rates. Understanding these elements would be very useful when attempting to develop the most cost-effective and workable interventions that increase health care worker compliance with influenza vaccination.

Although Study 1 was able to show a significant increase in vaccine uptake among hospital staff (54% vs. 42%, $p < .05$), there was still a large proportion of HCWs that did not accept influenza vaccine (approximately 45%). Since the decision to accept or reject influenza vaccine is a personal one (Gallant, Vollman & Sethi, 2009), it seems logical that psychological predictors (or psychosocial predictors) are important considerations when attempting to design a HCW influenza immunization program. It would also be appropriate that research attempting to pinpoint the important psychosocial predictors of influenza vaccine uptake ground its hypotheses in existing empirical

evidence from the behavioural sciences. Therefore, it seems appropriate to ascertain if other predictors are important when attempting to influence seasonal vaccine uptake among a HCW population using survey methodology.

CHAPTER 4: Study 2

Understanding the psychosocial predictors of seasonal influenza vaccine acceptance among health care workers: An exploratory study

In Study 1, a peer champion intervention was designed, tested and supported.

Although there is clear evidence that the champion process was successful, there was no formal follow-up or evaluation post intervention survey to determine which elements of the TPB were most important for vaccine uptake. Since the impact of a peer champion had an obvious positive impact on seasonal influenza vaccine uptake among a HCW population, it is important to assess which elements are predictive of intentions to receive seasonal influenza vaccine. In addition, the peer influence elicited via the champion process also needs to be better understood to determine how the social influences present in Study 1 (peer vaccine champions) impact the decision to receive a seasonal influenza vaccine among a HCW population. Is simply having a champion present enough to motivate HCWs to accept seasonal influenza vaccine, or do peer or social influences elicit other aspects of normative behaviour such as morality that also guide the decision to accept vaccine? To answer this question the subjective norm element of the traditional TPB could be enhanced to include other normative beliefs.

Extending Subjective Norms to Include Additional Social Perceptions & Influence

Previous research within sociology and applied social psychology has presented some convincing arguments that perceptions of how groups or the society at large behave can influence individual behaviours in a variety of contexts. One such theory that supports this position is the Focus Theory of Normative Conduct (FTNC) (Cialdini,

Reno, & Kallgren, 1990). According to the FTNC, *descriptive norms* describe what is typical or normal, or what most people do. Descriptive norms motivate by providing evidence as to what will likely be an effective and adaptive action. According to Cialdini et al. (1990), if an individual believes that most people are behaving a certain way they will act in a similar manner. This is even true when the attitude toward certain behaviour is “morally neutral” (e.g., choosing consumer products, looking up at the sky). *Injunctive norms* refer to the rules and beliefs of what qualifies as morally appropriate behaviour. Instead of focusing on what “is done”, injunctive norms focus on what “ought to be done”. For example, an individual might choose not to litter because they find it morally wrong. Although there has not been a plethora of research supporting the influence of injunctive and descriptive norms when promoting healthy behaviours, there have been some recent attempts. Slaunwhite, Smith, Fleming & Fabrigar (2009), discovered that the FTNC could be influential when promoting healthy behaviours within a work setting. Poster prompts using a focus theory of normative conduct framework were responsible for a 6% increase in stair-climbing behaviour above a baseline measure in a public setting. The use of peer vaccinators in Study 1 has also been considered an effective strategy due to the impact of social influence and the perception of how others in an individual’s peer group are behaving (Slaunwhite, Smith, Fleming, Strang, & Lockhart, 2009). Based on these recent studies supporting the application of the FTNC when promoting health related behaviour change, it was felt prudent to extend the theory of planned behaviour to include the more global measures of descriptive and injunctive

norms within the subjective norm factor. Figure 5 introduces the proposed model extending the TPB to include descriptive and injunctive normative influences.

Descriptive Normative Influences and Influenza Vaccine Acceptance among HCWs

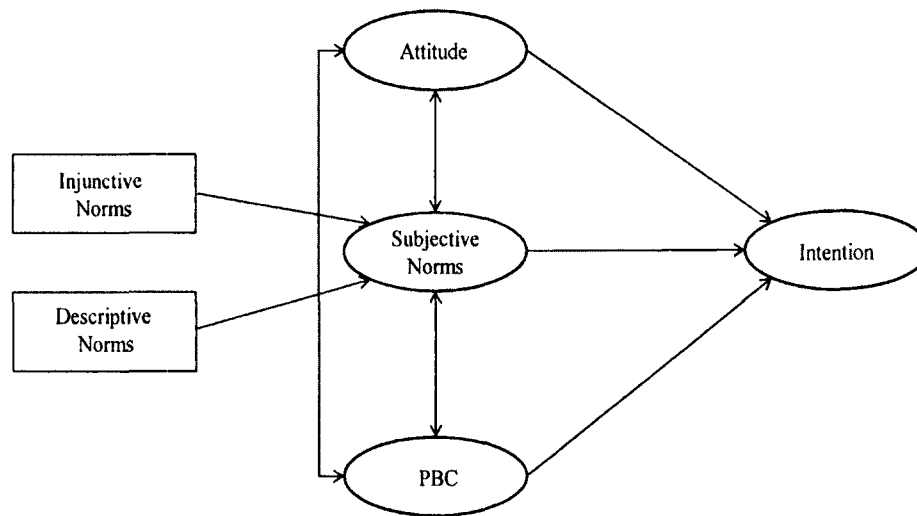
Descriptive normative influences are beginning to be considered as an important predictor of positive health behaviour and health behaviour change (Slaunwhite, Smith, Fleming & Fabrigar, 2009). Although there have been no attempts to test the impact of descriptive norms specifically, perceptions of peer behaviour as a motivator have been assessed in previous vaccination research. Using a novel approach to increase vaccination of high risk patients, Barton & Schoenbaum (1990) investigated the influence of electronic feedback on physicians' decision to vaccinate against influenza. Results of this research suggest that physicians are more likely to vaccinate high-risk patients when they are aware of the frequency of influenza vaccination by other physicians (Barton & Schoenbaum, 1990). What was not explained in this research was the impact of relative frequency on behaviour. For example, Barton & Schoenbaum did not segment the physicians into high or low vaccinators, nor did they test for a possible threshold in frequency of vaccine behaviour. Specifically, there was no test to determine if a physician whom vaccinated high-risk patients 90% of the time was equally as persuaded by peer behaviour as was a physician whom vaccinated high-risk patients 30% of the time (as an example). Considering the results of Study 1 specifically, one can make a logical assumption that knowing how many members of your unit received vaccine, or witnessing others in the unit accept vaccine, would be a driver for vaccine uptake. Based

on the aforementioned research, it seems likely that descriptive normative influences would be an important predictor of vaccine uptake in a HCW population.

Injunctive Normative Influences and Influenza Vaccine Acceptance among HCWs

The influence of morality on vaccine acceptance has been highlighted in recent publications (Falomir-Pichastor, Toscani, & Despointes, 2009). Specifically, results from this study suggested that the decision to accept or reject annual influenza vaccination was contingent on the perception of duty of care. Although the TPB does include subjective norms in its design, the impact of duty of care or morality does seem more closely aligned with Cialdini's FTNC. Based on this assumption it is predicted that injunctive norms will be highly correlated with traditional subjective norm items. Furthermore, the relationship between injunctive norms will be unique to the subjective norms factor and not significantly correlated with other factors of the TPB such as attitudes and PBC.

Figure 5: *Proposed model linking injunctive norms and descriptive norms with Subjective Norms of TPB*



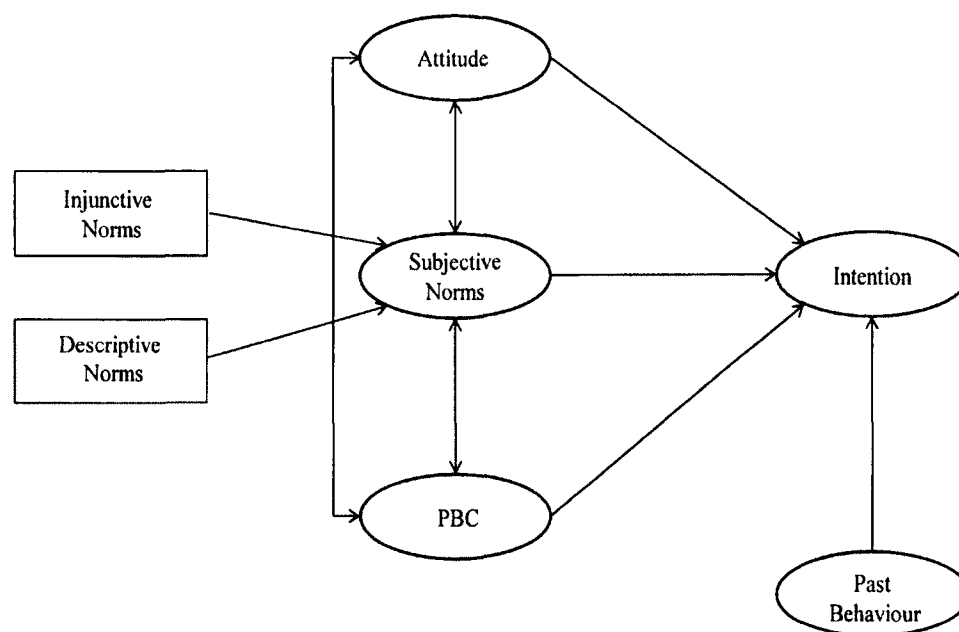
Past Behaviour

Although past behaviour is thought to be one of the best predictors of future behaviour, the influence of past behaviour on behavioural intentions and subsequent actual behaviour within the TPB has been debated by a number of researchers (see Ajzen, 1991, Conner & Armitage, 1998, Ouellette & Wood, 1998). Some research has shown significant increases in explained variance of up to 7% in intentions and 13% in behaviour by adding a measure of past behaviour to the TPB (Conner & Armitage, 1998). Others have advocated for the inclusion of a measure of past behaviour when intentions

are weak and unstable or when people have not developed a clear action plan (Ajzen, 2002). Skar, Sniehotta, Araujo-Soares, & Molloy (2008) suggest that if one controls for the influence of past behaviour (by entering past behaviour into the first block of a regression analysis), one can assess the unique impact of additional variables. According to Ouellette & Wood (1998) past behaviour can influence future behaviour in two important ways. The first potential influence of past behaviour on future behaviour involves the information obtained from performing a particular behaviour in the past. If an individual has performed a particular behaviour in the past, it is argued that the information obtained during that process will shape their beliefs regarding that behaviour in the future via a conscious response (Ouellette & Wood, 1998). Based on this rationale, the previous experience with the target behaviour should be mediated by the predictors in the TPB. If past behaviour can explain additional variance in actual behaviour, the TPB is not considered an adequate model to explain the desired behaviour and additional variables should be considered. The second potential influence of past behaviour on future behaviour is via habit where by the repeated performance of behaviour elicits an automatic response. In this situation, the impact of intentions, and the other TPB variables, on the target behaviour have no impact on the desired behavioural outcome. In this situation, researchers suggest that the desired behaviour is under habitual control (Ouellette & Wood 1998; Norman & Conner, 2006). It is also reasonable to assume that similar psychosocial predictors (e.g., attitudes, PBC, subjective norms) were responsible for predicting the behaviour in the past; therefore it is not sufficient to simply use past behaviour as a unitary predictor of future vaccine uptake or to guide future influenza

vaccine interventions. To establish a potential link between past behaviour and future behaviour it is important to test the influence of the TPB variables on actual behaviour and determine if past behaviour adds incremental variance when attempting to explain actual behaviour (see figure 6). If past behaviour does explain additional variance in intentions to receive seasonal influenza vaccine, there are additional psychosocial variables, aside from the TPB variables, that should be considered. If there are additional variables that should be considered this finding will have implications for future seasonal influenza vaccine interventions.

Figure 6: Proposed model assessing the impact of the TPB on HCW's intentions to receive seasonal influenza vaccine



Considering the behaviour of seasonal influenza vaccine uptake, there has been some support for the predictive validity of past behaviour. For example, Gallagher & Povey (2006) controlled for the impact of TPB variables in an elderly population and discovered that past behaviour accounts for a significant amount of variance in vaccine uptake. Although past behaviour may be an important variable for consideration, it is

important to note that episodes of past behaviour cannot be utilized as an absolute indicator of habit. If past behaviour is found to add incremental variance to the prediction of intention, or moderate the relationship between TPB variables and intention, one can only assume that past behaviour is highly correlated with intentions or behavioural outcomes and not that the behaviour is automatically activated or occurs subconsciously (Bargh, 1994). Furthermore, the opportunity to perform behaviour is an important consideration when attempting to understand the predictive validity of the TPB and the importance of past behaviour. Previous research has shown that in situations where an individual has limited opportunity to perform a behaviour (annual flu clinics), the past behaviour-future behaviour relationship is mediated by conscious intentions (predicted by attitudes, subjective norms and perceived behavioural control).

In order to better understand the potential impact of the TPB variables, Study 2 was designed to assess the relationship between a modified TPB framework and seasonal influenza vaccine intention among a HCW population. Past behaviour was also included to determine how effective the modified TPB is at predicting intentions to receive a seasonal influenza vaccine among a HCW population.

Overview and Goals

Due to the inability of Study 1 to identify the specific psychosocial forces⁷ that were influencing the acceptance of an influenza vaccine, Study 2 was designed to better understand if a modified TPB framework is an adequate theory to explain vaccine uptake among a healthcare worker population. Study 2 involved a number of key strategies.

The first strategy included the development and validation of a “perceptions toward influenza vaccine survey”. Traditional survey development procedures were followed to ensure the final survey was valid and reliable. A series of factor analytic procedures were conducted to determine if the perceptions toward influenza vaccine survey items were related to the latent structure of the TPB (attitude, subjective norms and PBC). An extension of the TPB was tested which included elements of the FTNC framework (Cialdini, Reno & Kallgren, 1990) as potential elements of the subjective norm factor.

Following the creation of an adequate framework, the second strategy involved logistic regression analysis to assess the predictive validity of the modified TPB items when controlling for the impact of previous years vaccination uptake (past behaviour).

⁷ In this context psychosocial forces refer to the HCWs attitude toward the flu shot, the influence of significant others in the HCW's life (e.g., family, friends, and co-workers) as related to accepting a seasonal influenza vaccination and whether or not they have control over receiving a vaccine.

Hypotheses

Hypothesis 1: The factor structure of the adapted TPB influenza vaccine items will conform to the modified TPB factor structure.

Hypothesis 2: The addition of the novel normative influences (injunctive/descriptive) will be highly correlated with subjective norms and will create a single “Normative Influence” factor.

Hypothesis 3: The TPB items will account for a significant amount of variance in intention to receive seasonal influenza vaccine.

Hypothesis 4: The addition of past behaviour will not add incremental variance in intention to receive seasonal influenza vaccine when controlling for the TPB variables.

Methodology

A total of 2566 health care workers at an acute care facility in eastern Canada were invited to take part in our perceptions toward influenza vaccine survey prior to the 2007 seasonal influenza campaign. A mixed methodology using online data collection and paper and pencil formats was utilized for this study. Clinical staff, support staff and administrative staff received an invitation to participate, an information/consent form (Appendices C & D) and the perception toward seasonal influenza vaccine survey (Appendix F) through internal District Health Authority (DHA) mail. Completed surveys were sent back via internal mail and remained anonymous. Due to internal communication policies of the (DHA), physicians were sent a separate e-mail invitation to participate via the medical staff office and a consent form with the web link to the on-

line survey (see Appendix E). No identifying information was collected in this study except for the general demographic information contained within the questionnaire. Results were reported in metrics of work units rather than at an individual level. In order to ensure confidentiality, no signed consent form was used. Return of the survey was assumed to represent consent of the respondent. The hospital's research ethics board and Saint Mary's University's research ethics board approved this research. At the time of this study, the participating healthcare organization had a formal policy recommending that all staff receive an annual influenza vaccination (Appendix H).

Instrument Development

In order to gauge the extent to which psychosocial factors are influential in predicting influenza vaccine acceptance a TPB based survey was designed. Survey items included questions related to attitudes, subjective norms, perceived behavioural control, intention to receive vaccine, previous vaccine behaviour, barriers and facilitators to vaccine acceptance and demographic information. A copy of the perceptions toward seasonal influenza vaccine survey can be located in Appendix F.

Content Validation

Following the development of specific items to measure vaccine acceptance in HCWs, Subject Matter Experts (SMEs) assessed and agreed upon a final item set. A multidisciplinary team consisting of an occupational health and safety manager in an acute care hospital facility, psychometrics experts, social and applied psychologists and a community medicine specialist physician participated in the content validation process. A

final survey of twenty-nine items was retained. Listed below are the content areas associated with the various elements of the perceptions toward influenza vaccine.

Demographic Items

Demographic information included gender (male/female), organizational or department unit (e.g., pharmacy, administration) and whether or not the individual has dependents (parents, children, spouse, etc.) at home.

Attitudes

In order to assess individual attitudes toward influenza vaccination the Crites, Fabrigar & Petty (1994) semantic differential attitude measure was adapted for use in this study. Individuals were asked to report their general opinions regarding receiving an influenza vaccination. The eight options in this scale included (1) Positive, (2) Useless (reverse scored), (3) Worthless (reverse scored), (4) Negative (reverse scored), (5) Effective, (6) Valuable, (7) Useful, and (8) Ineffective (reverse scored). Respondents were advised to rate each of the options using a 1-5 scale with 1 being 'not at all' and 5 being 'definitely'. Cronbach's alpha for these items was .929.⁸

⁸ Due to an error in data entry for an online portion of this study, items #7 (Useful) and #8 (Ineffective) were not included in the options provided to medical staff for the online survey portion. A series of analyses were conducted to compare the full item scale with the shortened six item scale and there is consistency between the two scales. The two scales are correlated .994. Cronbach's alpha for the eight item scale = .951.

Subjective Norms

Traditional TPB subjective norms were assessed using a three-item composite scale. Items in the subjective norm scale included “My family/friends think it is important for me to receive a flu shot”, “My supervisor believes that it is important for me to receive a flu shot”, and “My co-workers do not think it is important for me to receive a flu shot” (reverse scored). All responses on this scale ranged from 1 (Disagree Strongly) to 5 (Agree Strongly). Cronbach’s alpha for these items was very low at .429.⁹

Injunctive and Descriptive Normative Influences

As previous research has supported the predictive ability of descriptive and injunctive normative influences on health related behaviours (Slaunwhite, Smith, Fleming, Strang & Lockhart, 2009, Slaunwhite, Smith, Fleming & Fabrigar, 2009), four additional items were included to assess the impact of these variables.

Injunctive norms or morality was assessed with the items “Health care workers should receive an annual flu shot”, and “It is my moral responsibility to receive a flu shot each year”. All responses on this scale ranged from 1 (Disagree Strongly) to 5 (Agree Strongly). Two item bivariate correlation for this scale was .642.

Descriptive norms were assessed with two items “In your estimate, what percentage of employees in your unit received a flu shot last year?” and “In your estimate, what percentage of employees receive a flu shot in this organization?” The initial responses on this scale were captured with an open-ended response from 0-100%.

⁹ Elimination of specific items did not improve overall reliability/internal consistency of scale.

The two item correlation for this scale was .55. All injunctive and descriptive normative items are based on the FTNC (Cialdini, Reno, & Kallgren, 1990).

Composite Normative Influence Scale

As previous research (Ajzen 1991, Francis et al., 2004) has supported the inclusion of injunctive and descriptive influences when assessing normative influences, and due to the low internal consistency of the subjective norm scale, a composite normative scale was created to assess the effect of subjective, injunctive and descriptive norms. Cronbach's alpha for this scale was much improved at .679.¹⁰

Perceived Behavioural Control

A composite scale including two items related to perceptions of control over receiving an influenza vaccine was created. Items in this scale included "I am able to decide whether or not I receive a flu shot" and "I do not have enough time to receive a flu shot" (reverse scored). All responses on this scale ranged from 1 (Disagree Strongly) to 5 (Agree Strongly). Two-item correlation for these items was -0.04.

Intention to Receive Influenza Vaccine

Intention to accept an influenza vaccine was measured with the item "Do you plan on getting a flu shot this year?" Response options for this item included a dichotomous response of yes (coded 1) or no (coded 0).

Past Behaviour

The decision to accept or reject an influenza vaccine during the previous year's influenza campaign was assessed using the item "Did you have a flu shot last year?"

¹⁰ Cronbach's alpha is based on standardized item scores as descriptive norms are assessed on a 0-100 scale.

Response options for this item included a dichotomous response of yes or no. Previous research has supported the predictive validity of past influenza vaccination decision and intention to receive a seasonal influenza vaccination (Gallagher & Povey, 2006).

Data Analysis Strategy

A two tier exploratory factor analytic approach using principal components analysis was utilized for Study 2. First, it was important to determine if the TPB items created for this study were measuring the theoretically hypothesized elements of the TPB (attitude, subjective norms and PBC). Second, assessing which components the novel normative items load on was required to determine if they load on to the hypothesized structure. In order to determine if the hypothesized latent factors are predictive of intentions to receive vaccine and assess the impact of past behaviour a hierarchical logistic regression analysis was utilized. All statistical analyses in Study 2 were performed using Predictive Analytics Software (PASW) version 18.

Results

Demographics

A final sample of 823 surveys (response rate = 32%) were returned via the health care organization's internal mail system (N = 738) and via online survey completion (N = 85). Among the 823 participants, 82% were female (N = 672) and 17% were male (N = 143). Eight participants did not select a gender. Following data cleaning and screening procedures a final sample size of N = 797 was retained for data analyses. Approximately 83% (N = 660) of participants reported that they intended to receive a seasonal influenza vaccine for the upcoming flu season. Fourteen percent (N = 113) did not intend to accept vaccine that year. Twenty-four individuals did not respond to this item. The majority of respondents reported that they received a seasonal influenza vaccine the previous year (N = 635) with approximately 17% (N = 144) of respondents reporting they did not accept

vaccine for that flu season. Eighteen participants did not respond to this item. Thirty seven percent (N = 292) of respondents reported having dependent children at home, twenty-five percent (N = 205) reported no dependents at home, twenty percent (N = 159) reported other and 4 % (N = 30) reported having elderly relatives at home. Fourteen percent (N = 111) of the sample left this section blank.

Preliminary Construct Validation

Eleven TPB items were subjected to a Principal Components Analysis (PCA) with oblique (Oblimin) rotation (N = 797). The number of factors was determined by eigenvalues greater than one, and factor loadings greater than .40 were considered to load on that specific factor (Nunnally, 1978). None of the items had factor loadings above .30 across more than one factor (Tabachnick & Fidell, 2001). Based on this rationale, three factors were extracted which account for 64.43% of the variance. Results of the PCA and the three factor model are presented in Table 3.

Figure 7: Scree Plot for preliminary TPB principal components analysis

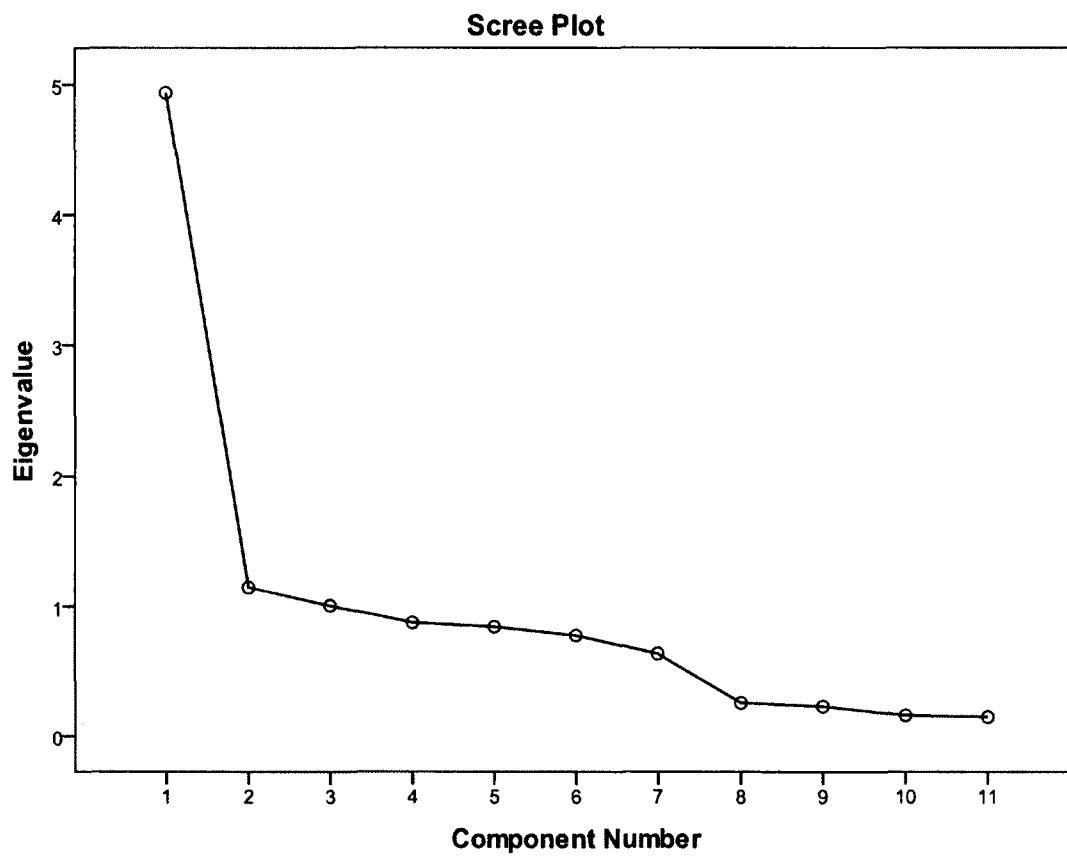


Table 3: Rotated factor loadings for principle components analysis of TPB items (pattern matrix)

Item	Attitude	Subjective Norms	PBC
Worthless	.908	-.070	.010
Negative	.898	-.110	.020
Useless	.896	-.041	.082
Positive	.844	.080	-.039
Valuable	.832	.067	.015
Effective	.782	.116	-.016
My co-workers do not think it is important for me to receive a flu shot	-.086	.791	.238
My supervisor believes that it is important for me to receive a flu shot	-.011	.654	-.088
My family/friends think it is important for me to receive a flu shot	.295	.416	-.047
I do not have enough time to receive a flu shot	.121	.396	-.193
I am able to decide whether or not I receive a flu shot	.097	.028	.960
<i>Eigenvalue</i>	4.93	1.14	1.00
<i>Cumulative variance explained</i>	44.88%	55.28%	64.43%

Note:

Extraction method: Principal Components Analysis

Rotation Method: Oblimin with Kaiser Normalization. Rotation converged in 5 iterations.

Interpretation of factors extracted:

Factor 1 includes the six attitude items as assessed by the semantic differential scale.

Specifically, the “worthless”, “negative”, “useless”, positive”, valuable” and “effective” items loaded strongly on the first factor (factor loadings range from .78-.90) which is related conceptually to the traditional TPB attitude factor. This factor accounted for 44.88% of the total variance.

Factor 2 includes three items related to subjective norms. Specifically, “My co-workers do not think it is important for me to receive a flu shot”, “My supervisor believes that it is important for me to receive a flu shot”, “My supervisor believes that it is important for me to receive a flu shot” and “My family/friends think it is important for me to receive a flu shot” loaded moderately on the second factor (factor loadings range from .41-.79) which is related conceptually to the subjective norm factor of the TPB. Factor two accounted for 10.40% of the total variance.

Factor 3 includes two items related to perceived behavioural control; however one item “I have enough time to receive a flu shot” did not load highly on any of the factor in the pattern matrix. This item was excluded from further analysis in this study. The item “I am able to decide whether or not I receive a flu shot” loaded strongly on the third factor (factor loading = .96). This item is related conceptually to the PBC component of the TPB. Factor three accounts for 9.15% of the total variance.

Secondary Exploratory Factor Analysis

Four additional items were included to assess injunctive and descriptive normative influences on seasonal vaccine uptake. Since no items existed to assess these constructs, all items were created specifically for this study using the FTNC (Cialdini, Reno, & Kallgren, 1990) as a guiding theoretical framework. Based on this, the injunctive and descriptive normative items were subjected to a separate PCA with oblique (Oblimin) rotation to determine if they loaded on the subjective norm factor. All factor loadings above .40 were considered for inclusion in the respective factor (see Table 4).

Figure 8; Scree plot for secondary TPB principal components analysis with addition of injunctive and descriptive norm items

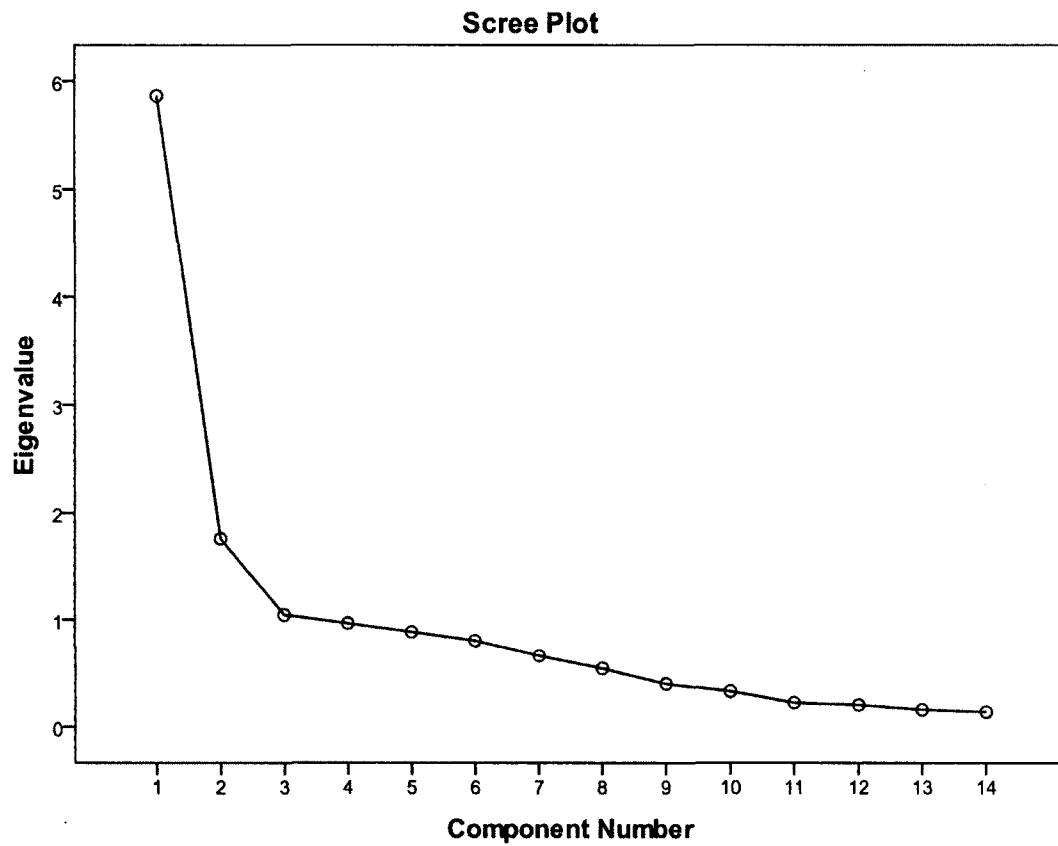


Table 4: Rotated factor loadings for expanded TPB model (pattern matrix)

Item	Attitude	SN	PBC
Useless	.889	-.065	.215
Worthless	.883	-.090	.200
Positive	.878	-.011	-.089
Negative	.861	-.139	.193
Valuable	.822	.083	-.077
Effective	.793	.055	-.097
HCWs should receive an annual flu shot	.807	.081	-.051
It is my moral responsibility to receive a flu shot each year	.622	.109	-.263
My family/friends think it is important for me to receive a flu shot	.402	.171	-.308
In your estimate, what percentage of employees in your unit received a flu shot last year?	-.031	.853	.041
In your estimate, what percentage of employees receive a flu shot in this organization?	-.186	.819	-.010
My co-workers do not think it is important for me to receive a flu shot	.109	.569	.182
My supervisor believes that it is important for me to receive a flu shot	.183	.338	-.128
I am able to decide whether or not I receive a flu shot	.075	.150	.844
<i>Eigenvalue</i>	5.86	1.76	1.04
<i>Cumulative variance explained</i>	41.90%	54.49%	61.96%

Note:

Extraction Method: Principal Component Analysis.

Rotation Method: Oblimin with Kaiser Normalization. SN = Subjective Norms

Interpretation of factors extracted:

Factor 1 included the eight attitude items as assessed by the semantic differential scale as well as both injunctive norm items hypothesized to load on to the “normative influence factor”. This factor accounted for 41.90% of the total variance.

Factor 2 included three items related to descriptive normative influences (perceptions of vaccine uptake of unit and total organization) and subjective norms (perceptions of pressure to receive vaccine from co-workers). Factor two accounted for 12.58% of the total variance.

Factor 3 included one item related to perceived behavioural control. Factor three accounts for 7.47% of the total variance.

Secondary assessment of internal consistency for revised scales

Normative Influences

Based on the results of the PCAs, sub-scales for the proposed TPB model were revised to predict seasonal influenza vaccine uptake. A secondary reliability analysis (scale) suggested the internal consistency of the composite norm scale would be greatly enhanced by omitting the item “my co-workers do not think it is important for me to receive a flu shot”. Based on this result, and the relatively low loading of this item on the normative influence factor (.569), this item was excluded this item from the normative influence scale. This scale then represented the influence of descriptive norms only. A detailed overview of the inter-correlations between dependent and independent variables, as well as the internal consistency of the scales can be located in Table 5.

Table 5: Interclass correlations, means and standard deviations of influenza survey variables for Study 2 using nonparametric Kendall's Tau analysis.

Variable	M	SD	1	2	3	4	5
Intentions	.85	.35	1.00				
Past Behaviour	.81	.38	.85**	1.00			
Attitude	4.23	.81	.47**	.44**	(.92)		
Descriptive Norms	67.07	16.74	.07*	.09**	.11**	(.67)+	
PBC (one item)	4.47	1.03	-.06	-.04	.09**	-.01	1.00

Note. N = 797. Intention to receive seasonal influenza vaccine coded 0 = no, 1 = yes; Previous year influenza vaccine coded 0 = no, 1 = yes. + = two item correlation between perceptions of percentage of unit and organization vaccine uptake. Internal consistency reported on diagonal in parentheses. ** denotes correlation is significant at the 0.01 level (2-tailed). * denotes Correlation is significant at the 0.05 level (2-tailed).

Predictive Validity

The first goal of Study 2 was to determine if the factor structure of the items created to predict seasonal influenza vaccine among a healthcare worker population adhered to the TPB framework. Results of the PCA suggest a three factor solution which partially conforms to the TPB model. The next step was to determine if the latent factors identified in the EFA were predictive of seasonal influenza vaccine uptake. In order to test the predictive validity of the TPB on intentions to receive seasonal influenza vaccine among a HCW population a binary logistic regression was performed. Since many assumptions such as the linearity of the relationship between independent variables and

the dependent variables, homoscedasticity, and normally distributed variables are not necessary in logistic regression (Tabachnick, & Fidell, 2001) they will not be reported. However, all observations were checked to ensure they were independent of one another, this assumption was satisfied.

Logistic Regression Analyses

A binary hierarchical logistic regression model was built treating intention to receive vaccine (1 = yes, 0 = no) as a dichotomous outcome variable. The independent variables were entered into two blocks (Block 1) Attitudes, Descriptive Norms and PBC and (Block 2) Past Behaviour. Testing the impact of the TPB variables in this way was able to accomplish two goals. First, I was able to determine if the TPB has predictive related validity with intentions to receive vaccine. Second, the addition of past behaviour in step two aided in explaining if the TPB was an adequate model to predict seasonal influenza vaccine uptake, or if additional variables should have been considered. Three predictors assessing attitude, subjective norms and PBC were entered into the first block of the logistic regression model. The addition of these variables significantly improved the model fit when compared to the constant only model ($\chi^2 = 341, p < .001$) with attitudes $\chi^2 (1) = 54.09, p < .001$ and PBC $\chi^2 (1) = .62, p < .05$ emerging as significant predictors of intentions to receive a seasonal influenza vaccine. Descriptive norms were not a significant predictor of intentions to receive seasonal influenza vaccine. Cox & Snell R-Square = .40 for the first block of the logistic regression suggesting that the TPB variables are accounting for approximately 40% of variance in intentions to receive seasonal influenza vaccine.

Since a plethora of research (see Ouellette & Wood, 1998; Norman & Conner, 2006) has supported past behaviour as a strong predictor of behavioural intentions, previous year seasonal influenza vaccine was entered in the second block of the hierarchical logistic regression to determine if past behaviour added incremental variance in intentions to receive seasonal influenza vaccine when controlling for the TPB predictors. The addition of past behaviour at step 2 significantly improved the model ($\chi^2 = 436, p < .001$) suggesting there are other important variables to explain intentions to receive seasonal influenza vaccine among a HCW population. Attitudes toward seasonal influenza vaccination continued to be a strong and significant predictor of intentions to receive seasonal influenza vaccine $\chi^2 (1) = 35.20, p < .001$. PBC and descriptive norms were not significant predictor of intentions to receive vaccine at step 2. Cox & Snell R-square = .490 suggesting the addition of past behaviour explained an additional 9% of variance in intentions to receive a seasonal influenza vaccination among a HCW population. Results of the hierarchical logistic regression analysis are present in Table 6.

Table 6: Summary of logistic regression analysis for variables predicting intentions to receive seasonal influenza vaccine

Step/Predictor	<i>B</i>	<i>SE B</i>	e^B	95% C.I for EXP (<i>B</i>)
<i>Step 1</i>				
Attitude	3.99**	.41	54.09	24.01-121.83
Descriptive Norms	-.16	.26	.84	.51-1.40
PBC (one item)	-.47*	.23	.62	.40-.98
<i>Step 2</i>				
Attitude	3.56**	.68	35.20	9.16-135.24
Descriptive Norms	-.18	.42	.83	.36-1.90
PBC (one item)	-.40	.37	.67	.32-1.4
Previous Behaviour	5.35**	.80	211.17	44.85-994.15

Note. e^B = exponentiated *B*. *N* = 797

* = $p < .05$, ** = $p < .001$.

Discussion

An exploratory factor analysis using principal component analysis suggested a three factor solution that partially conforms to the TPB. A clear pattern emerged where attitudes, subjective norms and one of the perceived behavioural control items all loaded on distinct factors (Hypothesis 1 partially supported). The results of this study offer moderate support for the TPB as an adequate theoretical model to explain seasonal influenza vaccine uptake and suggests that vaccine acceptance among HCWs can be explained using existing and supported social-psychological theory. Specifically, the TPB seems to fit the data reasonably well and offer researchers and practitioners in the area of vaccinology a starting point when designing interventions.

The hypothesized factor structure for subjective norms did not emerge as expected in Study 2. Although descriptive norms did load on to a common factor with two of the three introduced subjective norm items “my co-workers do not think it is important for me to receive a flu shot” (moderate loading .56) and “my supervisor believes that it is important for me to receive a flu shot” (weak loading .33), the injunctive norm items created specifically for this study load strongly on the attitude factor of the TPB. Although unanticipated, the loading of items that assess perceptions of co-worker seasonal vaccine uptake, and pressure from co-workers and supervisors seems logical as all of these elements are perceptions of what others in the organization expect. (Hypothesis 2 partially supported).

The result of the initial logistic regression analysis suggests that elements of the TPB are predictive of intentions to receive seasonal influenza vaccine among the HCW

population in this study. Of particular interest in Study 2, is the impact of attitudes and PBC on intentions to receive seasonal influenza vaccine. Attitudes were the most dominant predictor of intentions to receive seasonal influenza vaccine (Hypothesis 3 partially supported). This result is consistent with other research showing a strong association with evaluative attitudes and perceptions of seasonal influenza vaccine (Hollmeyer, Hayden, Poland, & Buchholz, 2009).

Although PBC was identified as a significant predictor of intentions to receive vaccine, the relationship is negative, and was not hypothesized. It is worthwhile to note that Norman and Conner (2006) discovered a negative relationship with PBC and intentions to engage in binge drinking. The authors speculated that the negative relationship could be attributed to external pressures to drink which the participants had little control (Norman and Conner, 2006). It is intriguing to consider if the same pressures were at work in the current study. The possibility that the negative result was due suppressor effect was also explored; however both the correlation and regression analysis produced negative associations suggesting no suppressor effect exists (Tabachnick & Fidell, 2001).

Although the impact of subjective norms were not supported in this study, it is possible that individuals were persuaded by organizational factors such as existing policy and an obvious seasonal influenza vaccine strategy. Also interesting is the possible influence of injunctive norms on intentions to receive vaccine. Since the items designed to assess injunctive norms loaded on the attitude factor, assessing the impact of morality, which presumably would reflect what they should do, or what is expected of them as a

HCW was not assessed directly. A post-hoc analysis did support the two injunctive norm items as a strong predictors of vaccine uptake when assessed univariately.

The results of the logistic regression analysis provide moderate support for the TPB when predicting intentions to receive seasonal influenza vaccine among a HCW population. However, adding past behaviour in the second block of the logistic regression analysis explained a significant increase in HCW intentions to receive seasonal influenza vaccine. Assuming that past behaviour is one of the best predictors of future behaviour, and that past behaviour was influenced by similar psychosocial variables as intention to perform a behaviour in the future and actually performing the behaviour at some point, additional investigation is required to determine which variables need to be added to adequately predict HCWs intention to receive seasonal influenza vaccine. The results of Study 2 do support attitudes as a significant and powerful predictor of intentions to receive seasonal influenza vaccine even when using a highly correlated (Pearson product moment correlation $r = .854$) proxy of past behaviour is an important finding. Essentially, using past behaviour as a predictor in the second block of the logistic regression equation leaves little opportunity to establish other significant relationships (Ajzen, 2002) and the finding that attitudes are still a significant predictor of intentions to receive vaccine is very promising for designers of future interventions to increase vaccine uptake. It is also worthwhile to note that the one-item PBC variable demonstrated significant predictive related validity in Study 2 and that the poor internal consistency and scale construction could have reduced the potential impact of PBC on intentions to receive vaccine (Hypothesis 4 partially supported).

Limitations

There are a number of potential methodological concerns with Study 2. First, the sole use of survey data increases the possibility of common method variance. Second, individual respondents could have responded positively to items on the survey due to social pressure and moral considerations inherent in this sample (healthcare workers). Third, items designed to assess descriptive norms are based on a 0-100 estimate of vaccine uptake and may have been processed differently versus a 1-5 likert scale.

The adequacy of PBC as a scale and useful factor in the TPB must be questioned due to the poor internal consistency of this scale as well as the meagre factor loadings. The use of one item to predict behaviour is problematic and should be re-assessed.

Due to a coding error converting the survey to an online format, two semantic differential items were excluded from the options presented to online participants. Although unfortunate, the error does not dramatically influence the results and correlations between the six item attitude scale and the eight item attitude scale is .994. The alternative option to simply exclude all online participants (N = 85) did not seem to be a logical solution to this issue based on the reduction in power and the loss of all physicians in this study.

This research did not use an actual proxy of vaccine behaviour and therefore cannot draw any specific conclusions with respect to actual vaccine uptake. Although intentions are thought to be one of the best predictors of actual behaviour the predictive utility of intentions is obviously not perfect (Fishbein & Ajzen, 1975, Ajzen, 1985, Ajzen, 1991). Also, previous research testing the TPB on intentions to receive flu vaccine

suggests that intentions are even less predictive when there is a lag between intention formation and the actual opportunity to perform the behaviour (Di Bonaventura & Chapman, 2005). Since influenza vaccination occurs only annually, it seems logical to test intention-behaviour stability with respect to seasonal influenza vaccine in a HCW sample.

Future Research

As Study 2 did not have a valid proxy of actual behaviour, future research should be conducted that has a valid indicator of vaccine acceptance. This is important for numerous reasons. First, if practitioners are using the TPB as a model to explain and understand vaccine acceptance among HCWs it is important to demonstrate that intention is in fact predictive of vaccine behaviour.

In addition, the relative weakness of PBC as a distinct factor needs to be explored. Future research should include additional items designed to assess PBC. These items should reflect aspects of internal and external control which were found to be important factors based on the open-ended portion of the staff survey in Study 2 and existing research on the multidimensionality of the PBC factor (Trafimow, Sheeran, Conner, & Finlay, 2002, Hofmann, Ferracin, Marsh & Dumas, 2006).

Although Study 2 partially supported the modified TPB as an adequate model to explain vaccine uptake among HCWs, it is important to replicate this study in additional acute care facilities. With an increased focus on the construction of the PBC scale, and the addition of other drivers and barriers for seasonal influenza vaccine uptake, future

research should strive to adequately explain intentions and subsequent vaccine behaviour.

Thus Study 3 was designed to address some of these issues.

CHAPTER 5: Study 3

A constructive validation study and establishing an intention-behaviour link

Overview and Goals

A conceptual framework using a modified TPB as a guiding theoretical model for vaccine acceptance among health care workers was tested and partially supported in Study 2. Although the findings of Study 2 are very promising, there are unanswered questions. First, as mentioned in the limitations section from Study 2, there was no valid measure of actual behaviour. Second, there appears to be lack of support for the PBC items as a significant predictor of vaccine acceptance among HCWs. A possible explanation of the ineffectiveness of the PBC items was the limited number of items included in the first study. To address this issue, additional items were added in an attempt to improve the internal consistency of the PBC scale. Finally, generalizing the results from Study 2 is challenging without adequate replication. Therefore, I re-circulated the adapted perceptions of influenza vaccine to a sample of HCWs within a paediatric care facility.

Based on the aforementioned highlighted limitations of Study 2, the goals of Study 3 are to (1) test the adequacy of the TPB in explaining intention to receive vaccine including a modified PBC item set, (2) test the predictive ability of intention to receive vaccine on actual vaccine uptake, and (3) to attempt to replicate the findings of Study 2 in a different health care facility.

Hypothesis 1: The amended perceived behavioural control items will result in a two factor scale that accounts for internal and external control.

Hypothesis 2: The TPB items will account for a significant amount of variance in intentions to receive seasonal influenza vaccine.

Hypothesis 3: Past behaviour will not explain additional variance in intention to receive seasonal influenza vaccine when controlling for the impact of the TPB.

The PBC is a very important variable in the prediction of intentions and behaviour in the TPB. The addition of PBC is the major addition to the TRA which did not have a measure of control or self-efficacy (Ajzen, 1991). As evident in figure 8, the PBC is not only expected to predict intention to accept seasonal influenza vaccine, but also directly predict vaccine behaviour in conjunction with intentions. This concept has important implications when using the TPB to predict vaccine intentions and subsequent uptake. When statistical models are built, the direct predictive influence of PBC should be considered along with that of behavioural intentions.

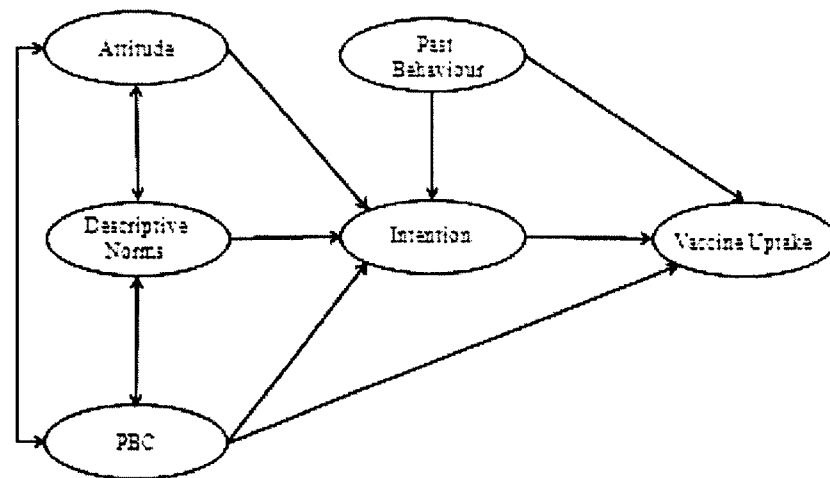
Hypothesis 4: Intentions to receive seasonal influenza vaccine and PBC variables will be predictive of seasonal influenza vaccine uptake among a HCW population.

Ouellette & Wood (1998) suggest that past behaviour plays an important role in the prediction of future behaviour in two important ways. Behaviours such as seasonal influenza vaccination are not performed frequently and therefore are less likely to be guided by unconscious or habitual response. Therefore, if past behaviour is entered into a regression equation after the TPB variables, any additional variance explained by past behaviour would suggest that the TPB is not sufficient and other psychosocial predictors are important. Since the TPB has been supported as a strong model for successfully

predicting a variety of different behaviours, I believe that past behaviour will not add incremental variance to the prediction of seasonal influenza vaccine among a HCW population.

Hypothesis 5: Past behaviour will not add incremental variance to the prediction of seasonal influenza vaccine uptake among a HCW population.

Figure 9: Proposed model assessing the impact of the TPB on HCW's intentions to receive seasonal influenza vaccine and subsequent vaccine uptake



Methodology

A total of 4917¹¹ health care workers at a paediatric care facility in eastern Canada were e-mailed an invitation to take part in the online perceptions toward influenza vaccine survey. Two hundred and sixty two respondents (response rate = 5.3%) which included 195 (75.4%) staff, 25 physicians (9.7%), 25 students (9.7%) and 14 volunteers (5.4%) responded to the online survey. Eighty-six percent of the respondents (N = 223) were female and fourteen percent (N = 36) male. Results are reported in metrics of work units rather than at an individual level. No individual is identified within the current study. In order to ensure confidentiality, no signed consent form was used, however all individuals were advised of the study procedures and informed consent procedures (Appendix G). Completion of the online survey was assumed to represent consent of the respondent. The hospitals research ethics board approved this portion of the research study. At the time of this study, the hospital had a formal policy related to seasonal influenza vaccination of staff (Appendix I).

Instrument Development

An adapted version of the influenza survey created in Study 2 was used with some minor changes to specific item sets. In particular, it was decided to make three key changes to the instrument based on the findings of Study 2. First, a limitation identified in Study 2 was the low number of items included to assess PBC. To address this limitation, three additional items were included to assess this dimension of the TPB. Second, a major addition to this dissertation is the inclusion of an actual proxy of vaccine behaviour.

¹¹ Although an attempt was made to e-mail all 4917 employees within this organization, it is impossible to determine how many employees actually received the invitation via e-mail. This resulted in a response rate that is much lower than one would expect.

Through the participating organization's internal database, the HCWs that actually accepted seasonal influenza vaccine were able to be identified. This is an important addition not only to the dissertation, but also to the progression of the TPB as a useful theoretical model when attempting to influence and explain vaccine behaviour. Additionally, an actual measure of behaviour will mitigate the intention-behaviour "black-box" problem often alluded to in TPB related research. Finally, a decision was made to assess intentions to receive vaccine via a five-point likert format for ease of interpretation.

Predictor Measures

Attitudes (Revised in Study 2). Individuals were asked to report their affective and evaluative opinions regarding receiving influenza vaccination. Eight semantic differential items including (1) Positive, (2) Useless (reverse scored), (3) Worthless (reverse scored), (4) Negative (reverse scored), (5) Effective, (6) Valuable, (7) Useful, and (8) Ineffective (reverse scored) were used in conjunction with "It is my moral responsibility to receive a flu shot each year" and "Health care workers should receive an annual flu shot" which loaded on the attitude factor in Study 2. Respondents were advised to rate each of the options using a 1-5 scale with 1 being 'not at all' and 5 being 'definitely'. Cronbach's alpha for these items was .92.

Perceived Behavioural Control. Results of a PCA (see table 7) performed on the PBC items suggest a two factor solution. The first factor includes the items "I do not have enough time to receive a flu shot" (reverse scored), "I have the opportunity to receive the flu shot if I want one", and "It is easy for me to receive a flu shot. All responses on this

scale ranged from 1 (Disagree Strongly) to 5 (Agree Strongly). Cronbach's alpha = .51. The second factor includes the items "I am able to decide whether or not I receive a flu shot" and "The decision to receive a flu shot is beyond my control" (reverse scored). All responses on this scale ranged from 1 (Disagree Strongly) to 5 (Agree Strongly). Two item correlation for this scale was .46.

Descriptive Normative Influences. As previous research has supported the predictive ability of descriptive normative influences on health related behaviours (Slaunwhite, Smith, Fleming, Strang & Lockhart, 2009, Slaunwhite, Smith, Fleming & Fabrigar, 2009), two additional items were included. The impact of descriptive norms were assessed with two items "In your estimate, what percentage of employees in your unit received a flu shot last year?" and "In your estimate, what percentage of employees receive a flu shot in this organization?" Bivariate correlation for these two items is .46.

Past Behaviour. Previous research has supported the predictive validity of past influenza vaccination decision and intention to receive a seasonal influenza vaccination (Gallagher & Povey, 2006). The decision to accept or reject an influenza vaccine during the previous year's influenza campaign was assessed using the item "Did you have a flu shot last year?" Response options for this item included a dichotomous response of yes or no. Two hundred and sixteen (N = 216 or 83%) respondents reported receiving a seasonal influenza vaccination the previous year.

Outcome Variables

Intention to Receive Influenza Vaccine. Intention to accept an influenza vaccine was measured with the item “Do you plan on getting a flu shot this year?”. Responses on this scale ranged from 1 (Not at all likely) to 5 (Extremely likely). Mean score for this item was $M = 4.69$.

Behaviour (Vaccine Uptake). Acceptance of seasonal influenza vaccine was captured via the health care organization’s internal data management system (Parklane). Response options for this item included a dichotomous response of yes (coded 1) or no (coded 0). According to the internal database, a total of $N = 225$ (87%) respondents received a seasonal influenza vaccine for the 2008 campaign.

Figure 10: Scree Plot-PBC Items for Study 3

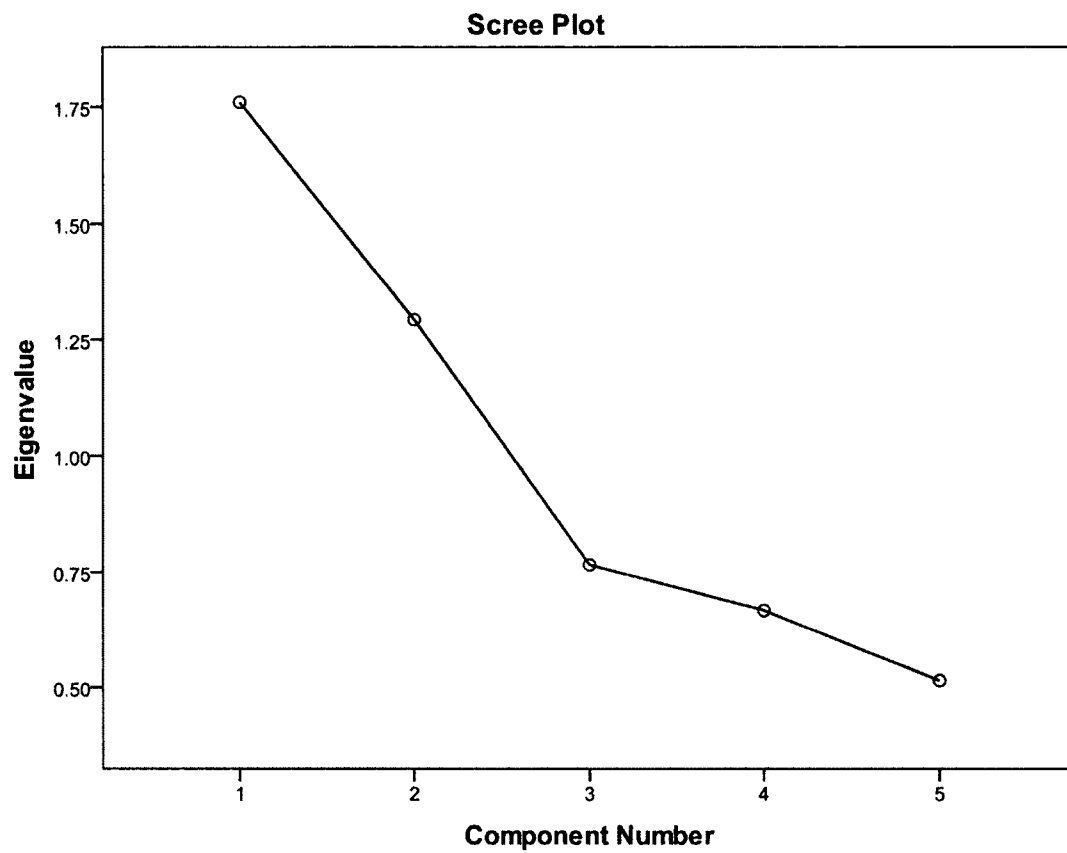


Table 7: Rotated factor solution-PBC

Item	Access	Control
It is easy for me to receive a flu shot	.83	-.08
I have the opportunity to receive the flu shot if I want one	.72	-.06
Do not have enough time	.69	.16
I am able to decide whether or not I receive a flu shot	-.08	.82
Decision to receive shot is beyond my control	.08	.79
<i>Eigenvalue</i>	1.7	1.2
<i>Cumulative variance explained</i>	35.20	61.05

Table 8: Descriptive data for measures used in Study 3 using nonparametric Kendall's Tau analysis.

Predictor	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7
1. Attitudes	4.45	.67	(.92)						
2. Descriptive Norms	66.86	16.03	.26*	(.46)					
3. Access	4.76	.46	.46*	.19*	(.51)				
4. Control	4.59	.66	-.21	-.06*	-.03	(.46)			
5. Past behaviour	.83	.37	.51*	.10	.44*	.02	1.0		
6. Intention	4.69	.89	.71*	.20*	.43*	.02	.57*	1.0	
7. Vaccine uptake	.87	.33	.24*	.11	.16*	.09	.22*	.43*	1.0

Note. Reliabilities reported on diagonal in brackets.

* $p < .001$ (2-tailed)

Data Analysis Strategy

Since additional items were included to assess PBC in Study 3, a secondary PCA was performed to ascertain the factor structure of the PBC items only. Following the identification of the factor structure, predictive analyses were conducted to assess the predictive validity of the TPB on both intentions to receive vaccine and actual vaccine uptake. Ideally, a Confirmatory Factor Analysis and Structural Equations Modelling (SEM) should be conducted to confirm the factor structure and predictive ability of this model; however a series of linear and logistic regressions were performed due to the substantial reduction in sample size caused by the omission of several responses for the open-ended proxy of HCW's perceptions of unit and organization vaccine uptake.

Since performing SEM was not appropriate¹² with a sample size of $N = 151$ (Kenny, 2011) a series of individual models were created to test the appropriateness of TPB when predicting seasonal influenza vaccine among a HCW population. The first model was created to assess the predictive ability of the TPB variables on intentions to receive vaccine. To achieve this, a hierarchical linear regression was performed controlling for the influence of TPB variables in step 1 and entering past behaviour into the second block of the analysis.

A second model was built to determine which of the TPB variables were predictive of seasonal influenza vaccine uptake. To achieve this, a hierarchical logistic regression was performed entering the TPB variables in block one and past behaviour in

¹² David Kenny uses one of the least conservative sample size goals of $N = 200$ when performing SEM. This was not achieved in Study 3.

block two. A follow-up study using a similar rationale was performed to determine if the excluded cases differed in any meaningful way.

Finally, analyses were performed to identify potentially influential factors in the champion process. This strategy was utilized to determine if the TPB is an adequate model to explain seasonal influenza vaccine among a HCW population that is exposed to a seasonal influenza vaccine champion.

Results

Data Analyses

All data was analyzed for accuracy, normality, linearity, homoscedasticity, and univariate and multivariate outliers. To assess accuracy, multiple cross checks were performed to ensure the data were entered properly. All assumptions were met and data appeared to be entered accurately.

Model 1: Hierarchical linear regression analysis testing the impact of TPB variables and past behaviour on intentions to receive seasonal influenza vaccine

To test the predictive ability of the TPB variables on intention to receive seasonal influenza vaccine, a two-step hierarchical linear regression analysis was performed. In the first step, the Theory of Planned Behaviour variables (i.e., Attitude toward seasonal influenza vaccination, Descriptive Norms associated with seasonal influenza vaccination and the two PBC items (control and accessibility) were entered. The second step of the hierarchical model included past vaccine uptake. As outlined in Table 9, the addition of the TPB variables accounted for a significant increase in variance in behavioural intentions to receive seasonal influenza vaccination $R^2 = .59$, $F(4, 145) = 53.08$, $p < .001$

($=.000$), $\Delta R^2 = .59$, $F_{\text{change}} = 53.08$ $p < .001$). Individually, only the addition of the attitude toward seasonal influenza vaccine scale ($\beta = .78$, $p < .001$) accounted for a significant increase in intention to accept seasonal influenza vaccine with individuals with more positive attitudes toward the seasonal influenza vaccine being more likely to intend to receive the vaccine. Neither descriptive norms ($\beta = .00$, ns), control ($\beta = -.07$, ns) nor accessibility ($\beta = -.01$, ns) were significant predictors of intentions to receive seasonal influenza vaccine.

The addition of past seasonal influenza vaccine uptake in step 2 accounted for a significant increase in variance in intentions to receive seasonal influenza vaccine $R^2 = .65$, $F(5, 144) = 54.59$, $p < .001$, $\Delta R^2 = .060$, $F_{\text{change}} = 25.21$, $p < .001$. Individually, past behaviour ($\beta = .29$, $P < .001$) was a significant predictor of intention to receive seasonal influenza vaccine. Results are reported in Table 9.

Table 9: Predicting intentions to receive seasonal influenza vaccine: Hierarchical regression analysis

Step/Predictor	<i>B</i>	<i>SE</i>	<i>t</i>
<i>Step 1</i>			
Attitudes	.78	.08	12.83**
Descriptive Norms	.00	.00	.05
Access	-.01	.12	-.02
Control	-.07	.08	-.92
<i>Step 2</i>			
Attitudes	.64	.08	10.39**
Descriptive Norms	-.01	.00	-.24
Access	-.06	.12	-1.04
Control	-.03	.07	-.68
Past Behaviour	.29	.14	5.02**

Note. N = 150, ** $p < .001$. Standardized *B*'s are reported.

Model 2: Hierarchical logistic regression testing the impact of TPB variables on seasonal influenza vaccine uptake

A binary hierarchical logistic regression model was built treating vaccine uptake (1 = yes, 0 = no) as a dichotomous outcome variable. The independent variables were entered into three blocks. As previous research (Ajzen, 1991) has supported the influence of intentions and PBC variables as direct predictors of behaviour, block one included intentions, access and control variables. The second block included the addition of attitudes and normative influences. The final block included a measure of past behaviour. The same logic used in Study 2 has incorporated in Study 3.¹³

The addition of intention and PBC variables in block one significantly improved the model fit when compared to the constant only model ($\chi^2 = 33.78$, $p < .001$) with intentions $\chi^2 (1) = 4.08$, $p < .001$ emerging as the only significant predictor of vaccine uptake. The addition of attitudes and normative influences in block two did not significantly improve model fit $\chi^2 (1) = .67$, *ns*. Since a plethora of research (see Ouellette & Wood, 1998; Norman & Conner, 2006) has supported past behaviour as a strong predictor of future behaviour and behavioural intentions, previous year seasonal influenza vaccine was entered in the third block of the hierarchical logistic regression to determine if past behaviour adds incremental variance in vaccine uptake when controlling

¹³ Testing the impact of the TPB variables in this way will accomplish two goals. First, I will be able to determine if the TPB has predictive related validity related to vaccine uptake. Second, the addition of past behaviour in step three will aid in explaining if the TPB is an adequate model to predict seasonal influenza vaccine uptake, or if additional variables should be considered.

for the TPB predictors. The addition of past behaviour at step three did not significantly improve the model ($\chi^2 = 1.24$, *ns*) suggesting the TPB is an adequate model to explain seasonal influenza vaccine among a HCW population even when considering the impact of past vaccine behaviour. Results of the hierarchical logistic regression analysis are present in Table 10.

Table 10: Hierarchical logistic regression analysis examining the incremental variance explained by the addition of TPB variables and past vaccine uptake

Step/Predictor	<i>B</i>	<i>SE B</i>	e^B	95% C.I for EXP (<i>B</i>)
<i>Step 1</i>				
Intention	1.40**	.36	4.08	2.01-8.27
Access	-1.57	.98	.20	.03-1.40
Control	.70	.48	2.02	.79-5.18
<i>Step 2</i>				
Intention	1.57**	.57	4.84	1.58-14.82
Access	-1.51	1.05	.22	.02-1.73
Control	.62	.49	1.87	.71-4.93
Attitudes	-.28	.75	.75	.17-3.28
Norms	.01	.02	1.01	.97-1.06
<i>Step 3</i>				
Intention	1.89**	.67	6.64	1.77-24.91
Access	-1.52	1.09	.21	.02-1.85
Control	.66	.50	1.93	.71-5.25
Attitudes	-.15	.77	.85	.19-3.87
Norms	.01	.02	1.01	.97-1.06
Past Behaviour	1.60	1.66	4.97	.19-128.68

Note. N = 259, * $p < .05$, ** $p < .01$, *** $p < .001$.
Intention measured on a 1-5 likert scale in Study 3.

Follow-up Analysis: Promoting seasonal influenza vaccine with unit champions

As a follow-up analysis, all individuals that responded to the “perceptions toward influenza vaccine survey” were also tracked to determine if the TPB was a valid predictor of seasonal influenza vaccine within a peer-champion only group. To achieve this goal a similar rationale to that used in Studies 2 and 3 was incorporated. The ability to better understand which psychosocial predictors are important for seasonal influenza vaccination within a championed group will greatly assist practitioners of future champion campaigns and ensure maximum uptake of vaccine within a HCW population. In Study 1, the champion process was shown to be an effective intervention to increase seasonal influenza vaccination; however, the study relied exclusively on anecdotal evidence to explain why the process was successful. In Studies 2 & 3 it was determined that elements of the traditional TPB were predictive of intentions to receive seasonal influenza vaccine. The first portion of Study 3 supports the TPB as a theoretical model to predict actual seasonal influenza vaccination among a general HCW population. Narrowing the focus to include only those HCWs that were exposed to a champion during the 2007 and 2008 seasonal influenza campaign will assist in identifying which psychosocial predictors are related to seasonal vaccine intentions and behaviour in a champion only group. If the TPB is able to account for a significant percentage of variance in intentions to receive seasonal influenza vaccine within the champion only group, and the addition of past behaviour does not add significant incremental variance, this result would suggest that the combination of the TPB psychosocial predictors and the

peer champion intervention process is a valid and powerful strategy to motivate HCWs to accept seasonal influenza vaccine.

Demographics: Via the organization's internal database (Parklane) I was able to determine that a total of $N = 32$ survey respondents were exposed to the champion process in 2008. Previous year vaccine uptake for the sub-sample of champions was 81% (26/32 accepted vaccine during the previous year influenza vaccination campaign)¹⁴. All of the individuals that were exposed to a champion and respondent to the influenza survey in this healthcare organization accepted vaccine (100% vaccine uptake) in 2008. Although there was no variance in vaccine uptake for those participants that were exposed to a vaccine champion, there was variance in intentions to receive vaccine with 3% responding they were not at all likely to intend to accept vaccine, 3% reporting they were undecided, 7% reporting they were likely to receive vaccine and 87% reporting they were extremely likely to accept vaccine.

Testing the Impact of TPB Variables among HCWs Exposed to a Vaccine Champion

A two-step hierarchical linear regression was built selecting only those cases that were exposed to a champion in the participating healthcare organization in Study 3 during the 2008 influenza campaign. In step 1 all TPB variables were entered to determine their impact on intentions to receive seasonal influenza vaccine. Results of step 1 suggest that the TPB variables account for a significant increase in variance in

¹⁴ It was not possible to ascertain if the individual was exposed to a champion during the previous year's vaccination campaign; however the same units were assigned a champion in 2007 and 2008 so the probability is high that the employee was exposed in consecutive years.

behavioural intentions to receive seasonal influenza vaccination $R^2 = .83$, $F(4, 17) = 21.48$, $p < .001$, $\Delta R^2 = .83$, $F_{\text{change}} = 21.48$ $p < .001$). Individually, only the addition of the attitude toward seasonal influenza vaccine scale ($\beta = .85$, $p < .001$) accounted for a significant increase in intention to accept seasonal influenza vaccine with individuals with more positive attitudes toward the seasonal influenza vaccine being more likely to intend to receive the vaccine. Neither descriptive norms ($\beta = -.01$, *ns*), control ($\beta = .02$, *ns*) nor accessibility ($\beta = .14$, *ns*) were significant predictors of intentions to receive seasonal influenza vaccine. This result suggests that attitudes toward seasonal influenza vaccine in and of themselves are powerful enough to predict the likelihood of receiving a seasonal influenza vaccination among the reduced $N = 22$ sample of HCWs exposed to a peer vaccine champion.

In step 2, the impact of past behaviour was entered. The addition of past behaviour in step 2 did not explain significant variance in intentions to receive seasonal influenza vaccine. $R^2 = .86$, $F(5, 16) = 20.46$, $p < .001$ ($= .000$), $\Delta R^2 = .03$, $F_{\text{change}} = 3.54$ $p > .05$). Results of this analysis are reported in Table 11.

Table 11: Predicting intentions to receive seasonal influenza vaccine among HCWs exposed to a champion: Hierarchical regression analysis

Step/Predictor	<i>B</i>	<i>SE</i>	<i>t</i>
<i>Step 1</i>			
Access	.24	.20	1.22
Control	-.03	.28	-.12
Attitudes	.95	.17	5.51**
Norms	-.01	.00	-.35
<i>Step 2</i>			
Access	-.05	.24	-.24
Control	.17	.28	.60
Attitudes	.81	.18	4.53**
Norms	.00	.01	-.35
Past Behaviour	.60	.32	1.88

Note. *N* = 22, **p* < .05, ** *p* < .01, *** *p* < .001.
Intention measured on a 1-5 likert scale in Study 3.

Secondary linear regression analysis excluding the descriptive norm variable

Since the inclusion of the descriptive norm variable resulted in a sample reduction of *N* = 10 cases, a second linear regression was performed excluding the descriptive norm variable so that all participants that were exposed to a champion would be included. The results of this analysis mirror those of the first regression analysis with one major difference. Specifically, results of step 1 suggest that the TPB variables account for a significant increase in variance in behavioural intentions to receive seasonal influenza vaccination $R^2 = .78$, $F(3, 28) = 34.03$, $p < .001$ ($=.000$), $\Delta R^2 = .78$, $F_{\text{change}} = 34.03$ $p < .001$). Individually, the addition of the attitude toward seasonal influenza vaccine scale ($\beta = .91$, $p < .001$) and accessibility ($\beta = .21$, $p < .05$) accounted for a significant increase in intention to accept seasonal influenza vaccine with individuals with more positive

attitudes toward the seasonal influenza vaccine and more perceived accessibility being more likely to intend to receive the vaccine. Control ($\beta = -.22$, *ns*) was not a significant predictor of intention to receive seasonal influenza vaccine.

The addition of past vaccine behaviour in step two of the hierarchical linear regression did not explain significant variance in intention to receive seasonal influenza vaccine. $R^2 = .80$, $F(4, 27) = 28.21$, $p < .001$ ($=.000$), $\Delta R^2 = .02$, $F_{\text{change}} = 3.09$ $p > .05$). Results of this analysis are presented in Table 12.

Table 12: Predicting intentions to receive seasonal influenza vaccine among HCWs exposed to a champion: Hierarchical regression analysis excluding a measure of normative influence

Step/Predictor	<i>B</i>	<i>SE</i>	<i>t</i>
<i>Step 1</i>			
Access	.34	.16	2.12*
Control	-.32	.19	-1.67
Attitudes	.96	.14	6.62**
<i>Step 2</i>			
Access	.15	.19	.788
Control	-.23	.19	-1.20
Attitudes	.89	.14	6.15**
Past Behaviour	.40	.23	1.76

Note. N = 32, *p< .05, ** p< .01, *** p < .001.
Intention measured on a 1-5 likert scale in Study 3.

Predicting vaccine uptake among peer champions

Since all participants that responded to the survey and were exposed to the champion process accepted vaccine, a binary logistic regression testing for impact on actual vaccine behaviour could not be performed. Although this analysis could not be performed, it is a logical assumption that as with the secondary analysis performed earlier in Study 3, there is a positive relationship between intentions to receive seasonal influenza vaccine and actual behaviour. To determine if the peer champion group did exceed expected frequencies of seasonal influenza vaccine uptake, a chi-square goodness of fit test was performed. Results suggest that the percentage of vaccine uptake did differ significantly between the championed and unchampioned groups $\chi^2 (1, 259) = 5.51, p <$

.05 (= .019). The expected percentage of vaccine uptake in the championed group was 86%; however all of the individuals exposed to the champion process in 2008 received seasonal influenza vaccine. Table 13 introduces the results from the chi-square test.

Table 13: Crosstabulation of individuals exposed to a peer vaccine champion and vaccine uptake

		Received Vaccine		
Champion Present		Yes	No	χ^2
Yes	Count	32	0	5.51*
	Expected	27.8	4.2	
No	Count	193	34	
	Expected	197.2	29.8	
Total		225	34	

Note: * = $p < .05$

Discussion

Study 3 was designed to replicate the findings in Study 2 and determine if the TPB predictors could predict intentions and actual seasonal influenza vaccine uptake among a HCW population. Additional PBC items were included to determine if perceived control over seasonal influenza vaccination was an important determinant of

vaccine uptake. Finally, a follow-up analysis was performed to determine if the TPB was an adequate model to explain seasonal influenza vaccination among HCWs that were exposed to a vaccine champion in 2008. Results of Study 3 suggest that the additional PBC items created a two factor solution which included control over accepting and accessibility of seasonal influenza vaccine (Hypothesis 1 supported).

As in Study 2, attitudes toward seasonal influenza vaccination were a significant predictor of intention to accept seasonal influenza vaccine among a HCW population (Hypothesis 2 partially supported). The addition of items within the PBC scale did not increase the predictive ability of this scale. In fact, even after careful inclusion of items suggested by TPB experts in TPB scale construction (Francis, Eccles, Johnston, Walker, Grimshaw et al. 2004) the overall internal consistency for this scale diminished. One possible explanation for the continued non-effect of the PBC scale is that the dimensions are measuring separate aspects of control which are internal and external. When re-examining the items contained within the PBC scale this hypothesis does seem logical when considering an item such as “I have the opportunity to receive the flu shot if I want one” which is likely capturing an individual’s perception of organization or supervisor support for vaccine uptake versus an item such as “I am able to decide whether or not I receive a flu shot”.

Similar to Study 2, the addition of past behaviour in the hierarchical linear regression suggested that other psychosocial factors could be added to explain intentions to receive seasonal influenza vaccine (Hypothesis 3 not supported). This finding has

important implications for future research which will be discussed later in the general discussion.

The results of Study 3 also suggest that the intention element of the TPB is an adequate predictor of seasonal influenza vaccination uptake among HCWs (Hypothesis 4 supported). This result is significant as it establishes an objective assessment of intentions to receive seasonal influenza vaccine with actual vaccine acceptance. This is a major contribution to field of vaccine promotion in healthcare organizations.

The addition of past behaviour in the hierarchical logistic regression model did not add significant incremental variance. This finding suggests that intention was a stable predictor of behaviour in and of itself (Hypothesis 5 supported). This finding suggests that once a HCW has made the conscious decision to accept vaccine, there is a strong relationship with actual vaccine acceptance.

Results of the follow up intervention suggest that the TPB was able to explain a significant amount of variance in intentions to receive seasonal influenza vaccine for those exposed to a peer vaccine champion. Unfortunately, a secondary logistic regression was not possible due to a lack of variance in actual vaccine uptake (100% accepted vaccine). The addition of past behaviour did not explain additional variance in intentions to receive seasonal influenza vaccine suggesting that the combination of the TPB and the champion process to be optimal when attempting to influence HCWs behaviour with respect to seasonal influenza vaccine uptake. The continued strength of attitudes within the champion only sample is noteworthy and suggests that strengthening the evaluative and affective elements associated with seasonal influenza vaccine is a worthwhile goal

for practitioners. Interestingly, accessibility was associated with intentions to receive vaccine in this sample which is certainly a unique finding from the other analyses conducted across studies 2 and 3. Vaccine champions promote vaccine uptake on units so it does seem reasonable that accessibility would be salient for this sample. Adding past behaviour to the second block of the linear regression did not add significant incremental variance suggesting that the TPB was adequate to explain intentions to receive seasonal influenza vaccine in the champion only population. Although the normative influence factor did not predict intentions to receive vaccine among the champion only sub-group, it is clear that having a vaccine champion is a strong descriptive norm (understanding what others in your group are doing) and could also be a referent for what is the morally appropriate thing to do as a HCW (injunctive norm).

Examining the impact of the TPB on intentions to receive seasonal influenza vaccine among the HCW participants of the peer champion intervention suggests that the TPB is an adequate model to explain vaccine uptake. Contrary to the other findings within this research, the addition of past vaccine behaviour did not add incremental variance to an individual's intention to receive vaccine. This result suggests that the theoretical predictors within the TPB could be valuable aspects of future peer champion interventions aimed at increasing seasonal influenza vaccination. Also, it is possible the combination of the peer champion process and the TPB drivers identified here work well as an intervention strategy. In Study 3, attitudes and accessibility were both significant predictors of intentions to receive seasonal influenza vaccination. Promoting the

champion process by a focus on how HCWs can take advantage of the direct assesses to vaccine champions and continued education and information campaigns seem logical.

Achieving 100% uptake of vaccine for the small sample of HCWs ($N = 32$) that responded to the survey is very encouraging; however this result must be treated with caution as we know that this result does not reflect the staff seasonal influenza vaccine uptake of the larger organization which was 54% in 2008.

Limitations

The internal consistencies for the PBC sub-scales were very low. Specifically, the control scale for PBC had a Cronbach's $\alpha = .46$ and the accessibility sub-scale had a Cronbach's $\alpha = .51$. The descriptive norm scale was also well below desired levels with a Cronbach's $\alpha = .46$. It is possible that these measures lead to the inadequacy of the TPB to predict intentions above a measure of past behaviour. Although it is possible that the internal consistencies of the PBC and descriptive norm items were contributing to the lack of prediction in intentions, the TPB items still explained 59% of variance in intentions to receive seasonal influenza vaccine. Using the open-ended estimate of vaccine uptake for unit and the organization as a whole as a predictor in this study was a limitation. First, a large number of participants left these items blank and conducting predictive analyses with the descriptive norm composite scale caused a large reduction in sample size (a reduction of 107 cases).

The inability to determine if the individual HCW was definitely exposed to a peer vaccine champion during the previous year's vaccination program is a concern; however it was confirmed that the same units were assigned a champion during the 2007 and 2008

influenza campaigns. There is still a possibility that the individual is new to the department, transferred from another department or was absent during the previous year's champion campaign. Conversations with the former manager of occupational health and wellness did confirm that the unit numbers were stable from 2007-2008 suggesting there was not a lot of turnover.

CHAPTER 6: General Discussion

Summary

The low seasonal influenza vaccine uptake among HCWs has been highlighted across a number of published studies internationally. The purpose of this research was to promote seasonal influenza vaccine via a peer champion process and to test the TPB as a conceptual model to predict seasonal influenza vaccine uptake among a HCW population. Study 1 was able to empirically support the efficacy of unit champions in the promotion and subsequent uptake of vaccine among a HCW population via a randomized matched pair design. Using this approach, peer champions were responsible for a 13% increase in seasonal influenza vaccination when compared to control groups. Although the results of Study 1 were very promising, it was difficult to promote and build on the successes of the champion process without first exploring the underlying drivers to the champion process and understanding which psychosocial factors potentially underpin this intervention. Studies 2 and 3 were designed to support the use of the TPB as a conceptual model which could aid in explaining why vaccine champions are successful in applied healthcare settings.

In Study 2, there was partial support for the TPB as a valid theoretical model to predict intentions to receive seasonal influenza vaccination among a HCW population. Specifically, the hypothesized relationship between attitudes and intentions were supported. Other individual level and modified TPB predictors were not shown to be influential when predicting intentions.

In Study 3, the TPB was also partially supported as a model to guide the uptake of seasonal influenza vaccine uptake among a HCW population. Attitudes emerged as a significant predictor of intentions to receive seasonal influenza vaccine. A major contribution to the vaccine literature was established in Study 3 linking vaccine intentions and an objective behavioural outcome (i.e., actual seasonal influenza vaccination). Finally, a follow-up analysis was conducted to examine the utility of the TPB when predicting seasonal influenza vaccine uptake among a championed population. Results partially support the TPB is an adequate theoretical model to explain intentions to receive seasonal influenza vaccine amongst a HCW population exposed to a peer vaccination champion. The link between the TPB and vaccine uptake could not be tested due to 100% uptake within the championed group in 2008.

The influence of the TPB in predicting seasonal vaccine uptake among HCWs

A major goal of this research was to test the adequacy of the TPB as a conceptual framework to ground seasonal influenza vaccine among a HCW population. The results of two strategic initiatives (Study 2 and Study 3) partially support the TPB as an adequate model to explain seasonal influenza vaccination intentions and subsequent vaccination uptake among a HCW population. The TPB was not able to account for all of the variance in intentions to receive vaccine when past behaviour was added to the regression models when a champion was not present. This result suggests that there are still other psychosocial predictors that are important to consider when attempting to increase HCW vaccine uptake when a champion is not being utilized. Based on this result, some may

question the order of entry in the linear regression analysis and whether the results would have differed if past behaviour was entered in the first block versus the TPB predictors. Therefore, the order of entry was reversed in order to determine if the magnitude of the effect was altered by adding past behaviour in the first block of the linear regression analysis. This change in sequence resulted in less variance (37.9% R-square change) being explained in intentions to receive seasonal influenza vaccine compared to the result when the TPB variables were entered into the first block of the linear regression model (59.2% R-square change). This is a clear indication that the TPB is an optimal framework, compared to a measure of past behaviour, to predict HCW intentions and vaccine behaviour. Implications for this result include possible changes to existing strategies for healthcare organizations when promoting seasonal influenza vaccine and a clearer focus on the individual TPB predictors identified as important in this research. For example, healthcare organizations could increase promotion of vaccine via a peer champion process and highlight the benefits to individuals, effectiveness of vaccine and the limited risk of adverse events. It was important to determine if a conceptual model, such as the TPB, could explain intentions to receive seasonal influenza vaccine among a HCW population as simply knowing past vaccine behaviour does little to guide the design and delivery of future intervention. Honing in on the individual level predictors such as attitudes, subjective norms and PBC reveals a great deal with respect to the differing psychosocial motivators for vaccine acceptance. A detailed review of the findings and opportunities for each individual level predictor is discussed below along with implications moving forward.

Attitudes

Across studies 2 and 3, attitudes emerged as the strongest individual TPB predictor of intentions. Although the magnitude of the effect of attitudes on intentions was reduced when past behaviour was added to logistic and linear regression analyses, attitudes still explained a significant amount of variance in self-reported intentions.

It makes intuitive sense that the attitude factor would be a strong predictor of seasonal vaccine uptake among a HCW population. Previous research has supported the importance of positive attitudes as a predictor of behaviour across a number of different populations and behaviour (e.g., binge drinking, exercise behaviour). Creating a positive evaluation and affective response to the target behaviour is the intention of many applied and theoretical interventions; however, research suggests many seasonal influenza vaccination campaigns fail due to the inability to tailor the intervention to the target audience. For example, the majority of the vaccine interventions reviewed in the literature review have a strong focus on increasing knowledge and perceptions of the vaccine, which are thought to be linked to evaluative attitude formation or change (Nowalk, Lin, Zimmerman, Fox, Raymund, Tanis, Harper & Willis, 2008, and Hofmann, Ferracin, Marsh, & Dumas, 2006). Discovering that attitudes were very positive across studies 2 & 3 ($M = 4.23$ and $M = 4.45$ respectively¹⁵) was not a surprise considering a HCW population, which presumably would have exposure to evidence and best practices associated with influenza vaccine, but does offer evidence that existing policies and

¹⁵ Anchors on the adapted attitude scale range from 1 (strongly disagree) to 5 (strongly agree) for semantic differential items such as “positive”, “worthless”, “useful”, etc. All negative worded items were reversed scored.

procedures aimed at increasing awareness and support for seasonal influenza vaccine is achieving its desired outcome. The focus now needs to be aligned with the predictors within the TPB that can be improved. It is also important to maintain the positive attitudes toward seasonal influenza vaccination as previous research does show that HCW's attitudes fluctuate year-to-year (Gavazzi, Filali-Zegzouti, Guyon, et al 2011). Success this flu season does not ensure that a healthcare organization will succeed next year.

Although there seems to be a ceiling effect with respect to attitude scores, findings from this research could still be used to support the inclusion of attitudes in the creation of interventions (such as the champion process in Study 1) to further increase vaccine uptake intentions among a HCW population. Understanding the impact of attitudes on intentions, and the subsequent relationship between attitude and behaviour is important for practitioners. For example, if healthcare organizations could identify individuals or groups that consistently have reduced evaluations of seasonal influenza vaccine (i.e. perception that vaccine is not effective) or a negative affective response toward seasonal influenza vaccine they could target these perceptions when information is being disseminated to staff. Second, future champion programs could incorporate a baseline survey to assess attitudes toward influenza vaccine to determine the relative strength prior to beginning a champion program. If the attitudes are highly positive, it is probably more appropriate to focus on increasing perceptions of other TPB related predictors such as accessibility or building counter arguments to diffuse the barriers to

vaccine uptake such as protecting personal immunity or potential emotional barriers such as fear or pain of vaccination.

Using a tailored approach to increase attitudes on select units will almost certainly assist at increasing vaccine uptake. Research (Ajzen, 2011) indicates that since attitudes are impacted by beliefs, it is important to target the belief strength through the creation of new beliefs which can be identified via elicitation studies. Ajzen (2011) suggests that information provided, even from a small number of participants, could be used to establish new beliefs which could in turn alter attitudes. In this research a number of drivers for vaccine were presented. Although a number of the items presented by participants linked with traditional drivers for vaccine uptake (e.g. patient safety, reduced illness, etc.), a number of participants listed other non-traditional drivers such as protection of family and significant others. It is interesting to consider strategies which are based on these open-ended comments (i.e., posters promoting the protection of self and family).

Referring back to the champion process in Study 1, it does make sense that attitudes are a key component of the decision to accept or reject a seasonal influenza vaccination; however the power of the other TPB predictors (e.g., norms and PBC) should not be dismissed. The presence of a unit champion, in and of itself, has important implications.

Subjective, descriptive and injunctive normative influences

The impact of subjective, descriptive or injunctive norms was not supported in studies 2 or 3. Prior to beginning the final two studies all reasonable precautions were taken to ensure that the item sets were adequate to measure normative influences; however this did not occur. Although a number of normative influence items were created to expand the subjective norm factor, the results suggest that normative influences load on two separate and distinct factors.

The first factor loading for the normative influence variables included the injunctive normative influences loading strongly with the attitude factor in the exploratory factor analysis. Once the injunctive items were considered within the attitude factor, the remaining normative items (descriptive and subjective) did appear to load on a second unique factor which included perceptions of co-workers, supervisors and estimated organizational vaccine uptake. Although this “organizational norm” factor did make sense conceptually, the predictive ability of this modified norm factor was not supported when conducting the regression analyses. A possible explanation for this result is that the items were too diverse to create a consistent referent group. For example, individuals could perceive supervisors as having an inherent desire to be vaccinated, but not their co-workers (or vice-versa). Also, access to their line supervisor could be difficult due to span of control concerns in healthcare organizations which limits the opportunity for direct contact with superiors and thus reducing the likelihood of an accurate estimate.

Descriptive norms as a univariate predictor

To further investigate the possible impact of descriptive norms on intentions to receive seasonal influenza vaccine, separate analyses were conducted. Interestingly, perceptions of the percentage of individuals within the same department or organizational group were a significant univariate predictor of intentions to vaccinate in studies 2 & 3. The impact of organizational vaccination rates was not a significant predictor of intention to vaccinate in any of the studies conducted here. This finding is interesting and could potentially open up many avenues for future research. For example, if one looks back to the Study 1 it is interesting to hypothesize if the actual knowledge of unit participation was a driving factor for vaccine uptake or participation in the champion process. If individual employees are more likely to accept seasonal influenza vaccine simply due to being aware of the unit or department average, this is a logical starting point for organizational health promotion or infection control efforts. Unfortunately this data was not collected apriori or post-hoc.

One possibility for the non-effect of descriptive norms could be associated simply with the fact that individuals do not know how many employees in the organization accept vaccine. Perhaps the impact of descriptive norms could be more powerful if organizations were more proactive at increasing awareness of vaccination acceptance. The one cautionary note is associated with health care organizations that have poor seasonal influenza vaccination records. Drawing attention to a dismal record (below 50% as an example) could actually have the opposite effect and decrease participation in flu

clinics or vaccine uptake. By highlighting what the majority are not doing (accepting seasonal influenza vaccine) has been implicated by researchers as making that behaviour appear as prevalent and therefore normal in other behavioural domains such as littering (Cialdini, 2003).

Contrary to original hypotheses, the injunctive norm items did not load on to the normative influence factor. This result was surprising and could suggest that the items were not adequately designed to assess injunctive norms.

Injunctive norms

The potential influence of injunctive norms in this dissertation is of particular interest. Beginning with the first study, one can appreciate the power of injunctive normative influences on a HCWs decision to accept or reject influenza vaccine. The power of peer persuasion is evident in the results from Study 1. One could argue that not only is the champion process eliciting injunctive norms, but also the descriptive norm of perceived frequency of vaccine uptake. In Study 2, an extended TPB model was introduced that attempted to expand the traditional subjective norm factor into elements of the FTNC. Although similar in nature, the FTNC injunctive and descriptive normative influences and the TPB subjective norm elements were shown to be separate factors when an exploratory factor analysis was conducted. When one considers which elements are associated with injunctive norms, it is no surprise that the items designed to assess injunctive normative influences “Health care workers should receive a seasonal flu vaccination” and “It is my moral responsibility to receive a seasonal influenza vaccine” were strong univariate predictors. Individuals that work in the health care sector are

driven by the desire to care and to do no harm. The individual items contained within the injunctive norm scale include elements of morality, duty of care and patient safety. These elements are the corner stone of any HCW's basic curriculum and are reinforced through professional guidelines, organizational mission statements, modelled by co-workers and peers, and demanded by society.

Perceived Behavioural Control

The negative relationship between perceptions of increased control over vaccine acceptance and seasonal influenza vaccination was not hypothesized; however Study 2 supports this finding. This result is interesting from a theoretical standpoint as one would expect an increase in perceived control to have a positive impact on intentions to perform health-related behaviours (Wallston, 1997). When considering the percentage of respondents that intended to receive vaccine this result is even more interesting. Prior to this research study, the logical hypothesis would be that as perceptions of control increased, intentions would also increase. The result from Study 2 offers another perspective. If individuals perceive that they have control over accepting vaccine, they are actually less likely to intend to receive a seasonal influenza vaccine. From an intervention design perspective this finding has important implications. Using messaging that highlights the amount of individual control is not likely going to increase vaccine uptake. In fact, the results of this research suggest the opposite. For example, suggesting that "the choice is yours" or "only you can prevent the spread of illness" may not be the best strategy to increase vaccine uptake. Instead, a focus on professional standards which

creates salience around “your professional responsibility” and a “shared and collective duty” is encouraged.

Comparing the results from studies 2 and 3, it is clear that there are no differences in the two samples with respect to mean PBC scores. From an organizational perspective this is intuitive as the employee seasonal influenza vaccine policies are very similar (see Appendices H & Appendix I) and do not suggest that the policy, in and of itself, would be a driving influence as neither organization has a mandatory vaccination policy. This is an important consideration when reviewing the descriptive data. I also explored the possibility of group differences to determine if perceptions of control differed among occupations across studies 2 and 3. Interestingly, results of an omnibus ANOVA suggest that there were significant differences between the occupational groups in Study 3 $F(2, 255) = 5.60, P < .05 (= .001)$. Perceptions of control were lowest among students that responded to the survey in Study 3. The mean score for control was $M = 4.08$ for students, $M = 4.62$ for employees and $M = 4.77$ for physicians suggesting that students felt they had significantly less control over the decision to accept or reject influenza vaccine.

This is a very interesting difference between the organizational groups and does warrant additional interpretation. If students perceive that they have less control over accepting or rejecting seasonal influenza vaccine, the question becomes why? One possible explanation for this result is the relatively junior role of the student in the healthcare system. Students could be accepting vaccine to socialize into the organization. Another possible driver for this result is the misperception by students that vaccine is

required for employment within the healthcare facility, which it is not. Another possible explanation for this result is the type of care that is being provided at the two organizations which participated in this research. The organization which participated in studies 1 and 2 is a large acute care facility which offers a number of highly specialized services to a large segment of Atlantic Canada. This healthcare facility has multiple locations and is primarily responsible for adult populations. The healthcare organization utilized in Study 3 provides specialized care to women and children. A result which suggests students have limited control over accepting or rejecting a seasonal influenza vaccine questions if there are possible cultural differences between the two organizations. It is also interesting to speculate if the social normative pressure (which is an indicator of culture) within the healthcare organization which participated in Study 3 was so powerful, that students actually perceived they had little control over accepting or rejecting a seasonal influenza vaccine. The results of the quantitative data do not support this hypothesis; however, previous research on binge drinking has found a negative correlation between PBC and external pressures (Norman & Conner, 2006). As social norms increase, do perceptions of control actually decrease for behaviours such as vaccine uptake?

Although unexpected in Study 3, the non-significant role of PBC has been discovered in previous research. Abhyankar, O'Connor & Lawton (2008) discovered that PBC was a non-significant predictor of women's intention to vaccinate their children against Measles, Mumps and Rubella (MMR). Similarly, research conducted by Gallagher & Povey (2006) discovered that the PBC had a non-significant relationship

with intentions to receive seasonal influenza vaccine in an elderly population. An additional explanation for the non-significant role of PBC in this study could be the poor internal consistency of the PBC scale. Cronbach's alpha for the PBC scale was sub-optimal in Study 3 and a one item measure was utilized in Study 2. This explanation seems reasonable and has been proposed by other researchers when PBC has not been predictive of behavioural intentions and the correlation between the two items is low ($\alpha = .53$) (Abhyankar, O'Connor & Lawton, 2008).

Is it all about attitude?

The health care organizations which participated in Study 2 and Study 3 disseminated seasonal influenza vaccination information to all staff prior to the champion campaign, therefore dramatically reducing the likelihood that information in and of itself is enough to increase vaccine uptake. This reality raises the question, which psychosocial predictors are influential when attempting to predict seasonal influenza vaccination among a HCW population? Ruling out the influence of normative influences does not seem to be a foregone conclusion, even after the findings presented in the predictive analyses in studies 2 and 3. For example, previous research suggests that humans are not conscious of the social normative influences they are exposed to on a daily basis and that they often under detect their persuasive power. Nolan, Schultz, Cialdini, Goldstein & Griskevicius (2008) discovered that although participants ranked peer (neighbour) recycling behaviour as the least influential on their own recycling behaviour and actions, the results of Nolan et al's (2008) research suggested that peer behaviour (descriptive norm) was in fact the strongest predictor of participants energy conservation behaviour.

Looking back to the follow up vaccine champion intervention conducted in Study 3, it is intriguing to consider if the individual respondents were able to clearly understand the power of peers in the promotion of seasonal influenza vaccine persuasion. If one accepts that all of the psychosocial influences are consistent within Study 3 (i.e., information), other than the presence of a peer vaccine champion, one can safely assume that the normative influence was enough to persuade the individual to accept vaccine.

Past Behaviour

The impact of past behaviour was shown to explain additional variance in intentions to receive seasonal influenza vaccine in a HCW population across studies 2 and 3 suggesting that other variables, in addition to TPB predictors; are important to explain HCWs intentions to receive seasonal influenza vaccine. Interestingly, past behaviour did not account for additional variance in actual vaccine uptake in Study 3. This is somewhat contrary to previous research which suggests past behaviour to be a stronger predictor of behaviour than it is with intentions to perform the target behaviour (Conner & Armitage, 1998). From a theoretical perspective, this result supports the stability of intentions and the TPB to predict behaviour. Once a HCW has the intention to perform the behaviour, the addition of past behaviour (and potentially habit) does not add incremental variance. On the other hand, past behaviour did add incremental validity to the prediction of intentions to receive seasonal influenza vaccine in studies 2 and 3 suggesting that other social cognitive factors are important when predicting intentions to receive seasonal influenza vaccine.

From a practical perspective this finding is important for a number of reasons. First, focusing specifically on past behaviour of staff is not sufficient when attempting to increase vaccine behaviour. Although this information is useful for internal benchmarking, the TPB appears to be a better predictor of seasonal influenza vaccine among a HCW population. Interventions designed around the previously mentioned TPB variables (Attitudes, Norms and PBC) should be more influential. Finally, the addition of past behaviour in the follow up champion intervention conducted in Study 3 did not add incremental variance to the prediction of intentions to receive seasonal influenza vaccine. This finding suggests that the TPB is an adequate theoretical model to explain and support the peer-led vaccine intervention. Future champion campaigns should include factors of the TPB when they are being designed.

Barriers and Drivers of Seasonal Influenza Vaccine for HCWs

To assess the perceived barriers and facilitators of vaccine acceptance, a series of open-ended items were created. Items in this section include “In the space below please list any benefits you can think of for not getting a flu shot”, “In the space below please list any reasons why you would get a flu shot this year”, and “In the space below please list any barriers that would prevent you from receiving a flu shot”. Although previous research has supported the influence of additional factors in HCWs decision to accept or reject seasonal influenza vaccination (see O’Reily, Cran & Stevens 2005), these individual factors were not influential in this research. Interestingly, when reviewing the qualitative responses from this research, the main organizational barriers for not

accepting vaccine listed from respondents were (1) lack of allocated time for vaccine clinics, (2) scheduling of vaccine clinics and (3) accessibility to vaccine clinics. Using this information as a quasi-elicitation study, I would expect the PBC items related to accessibility to be a strong predictor of intention to receive vaccine; however this was not supported. Protection of personal immunity was the most cited reason for HCWs refusal to accept seasonal influenza vaccination. This result was not surprising given previous research which identified no personal benefit for healthy individuals as a barrier for influenza vaccine uptake (O'Reilly, Cran & Stevens). A finding that was surprising in this study was the deviation from fear of adverse events as being the most common driver for non-compliance to protection of personal immunity surfacing as the most salient reason given. This result is contrary to previous research conducted in North America which has supported fear of adverse reactions (e.g., Guillain-Barre) as the driving force for refusing seasonal influenza vaccination (Safranek, Lawrence, Kurland, et al. 1991). Researchers have justified this finding in previous research by citing miscommunication of seasonal influenza messages which target at-risk groups (e.g., individuals with chronic illness or persons over the age of 65) specifically. The rationale is that HCWs become confused by seasonal influenza policies which target at risk groups and not healthy adults. A recommendation is to address the misconception that only at-risk persons can benefit from a seasonal influenza vaccine. Another possible explanation is that select HCWs in this population have prepared very convincing counterarguments to overcome social expectancies of vaccine acceptance. For example, protection of personal immunity is a much stronger argument than fear of needles or adverse reactions. It is very unlikely that

traditional educational or knowledge campaigns will change behavioural intentions of individuals citing concerns over protecting personal immunity. Managing the individual and organizational barriers identified in this study should also improve vaccine rates.

Theoretical Contributions

A major outcome in this study was the ability to empirically test and support vaccine intentions as a predictor of actual vaccine uptake. This result makes an important contribution to the theoretical research in vaccinology as well as social psychology. The bulk of previous research conducted on the TPB in this area has not used an actual proxy of vaccine uptake due to inadequate internal organization databases and lag of reporting. The research design in Study 2 was deliberately created to fill this void in research. Although sweeping conclusions cannot be made from a single research study, this result certainly supports future interventions that use intentions as a proxy for future vaccine uptake.

This research found that past behaviour added incremental variance when predicting intentions to receive seasonal influenza vaccine in a sample of HCWs that were not exposed to a champion, however past behaviour did not add incremental variance when HCWs were exposed to the champion. The addition of past behaviour did not add incremental variance when predicting actual vaccine uptake among HCWs (Study3). Based on previous research (Ouellette & Wood, 1998) this result suggests that seasonal influenza vaccine uptake requires conscious decision making and control. The decision is not automatic, nor does it reflect a habitual behaviour.

This dissertation also tested an extended TPB framework to determine if the subjective norm component could include elements of injunctive and descriptive norms (Cialdini, Reno & Kallgren, 1990). Results suggest that descriptive norms were associated with the traditional subjective norm items; however injunctive norms loaded strongly with attitudes.

Practical Contributions

Seasonal influenza vaccination of HCWs has implications for a variety of internal healthcare functions. The findings from this dissertation could be valuable to occupational health and safety, infection control, and patient safety practitioners. The results of this dissertation support the continued use of information campaigns to positively influence seasonal vaccine acceptance among a HCW population. The strong association between attitudes and seasonal vaccine uptake across studies 2 and 3 suggest that the information provided to HCWs is probably an important aspect of attitude formation, but not sufficient. Continued efforts to promote vaccine by the champion process and engagement of front-line staff are recommended. It is also critical to ensure that vaccine is accessible to HCWs as demonstrated in the follow-up intervention and through the qualitative responses provided by survey respondents. Although the accessibility factor of PBC was not a significant predictor of intentions or behaviour in Study 3, anecdotal reports and the champion process itself suggests that accessibility and convenience are contributing factors that should continue to be part of the champion process. A focus on increasing perceptions of individual control over seasonal vaccine

uptake is not recommended as a strategy in the design of future influenza vaccine interventions for HCWs at this time.

The creation of a unique survey to assess the important psychosocial factors for seasonal vaccine uptake among a HCW population is also a major contribution of this research. Practitioners within healthcare facilities should consider the impact of attitudes and the potential impact of champions (normative social influences) when designing future seasonal influenza vaccination interventions. An annual survey to assess attitudes and other important factors (identified barriers), used in conjunction with other organizational vaccination indicators (frequency of vaccine uptake), could be very important benchmarks for predicting the uptake of vaccine in future campaigns.

Using open-ended formats this research was able to identify numerous themes that seem complementary to previous findings in the seasonal influenza vaccine uptake literature. Specifically, the perceived impact of introducing a foreign substance into ones system was the major deterrent for those HCWs that did not accept vaccine regularly. Drivers for seasonal influenza vaccine uptake included protection of self, significant others, patients and overall prevention.

Future Research

Increasing Seasonal Influenza Vaccine

Future research should explore a variety of differential approaches to increasing seasonal influenza vaccination in a health care worker population. Determining which psychosocial predictors are important to add to the TPB is the primary recommendation

for future research. A number of post-hoc analyses were conducted to ascertain if omitted variables from the influenza survey added incrementally to the prediction of intentions to receive vaccine. Interestingly, the one item where an argument could be made that influenza vaccine knowledge is being assessed (I can become seriously ill from receiving a flu shot), did add incremental variance to HCW intentions to receive seasonal influenza vaccine. The addition of this item also reduced the amount of incremental variance being explained by the addition of past behaviour in Study 2 (6.2 to 5.4% of variance in intentions to receive vaccine). Future research should include a measure of seasonal influenza vaccine knowledge. It also seems worthwhile for future research to expand the TPB to include more emotional types of predictors, such as fear of needles that could potentially add to increased explained variance in intentions to receive seasonal influenza vaccine (Dutta-Bergman, 2005).

Incorporating the results of this dissertation research into the prediction of influenza uptake in other populations is also a worthwhile goal. In fact, one study has tested and supported the influenza survey (Appendix F) in a Human Immunodeficiency Virus (HIV) positive patient population (Kiberd, Cooper, Slaunwhite, Halperin, Haase, & McNeil, 2009). Further research is warranted that extends the research presented here into the prediction of influenza vaccine uptake in a general population.

Overcoming the strong counterarguments for not receiving seasonal influenza vaccine is an important avenue for future research. If promoters of seasonal influenza vaccine (i.e., occupational health, vaccine champions) can create rebuttals for the

counterarguments presented by HCWs, this could complement existing champion training and potentially increase vaccine coverage.

Attitude Stability

A number of studies within the vaccine promotion domain (see Gavazzi, Filali-Zegzouti, Guyon, et al 2011) have suggested that attitudes toward influenza vaccine fluctuate year-to-year. Although fluctuation in attitudes could be due to the frequency of seasonal influenza vaccine clinics (once per annum), there have been no attempts to measure attitude stability of seasonal influenza vaccine among a HCW population. Future research should investigate the relative strength of attitudes within this population and empirically determine if attitudes toward seasonal influenza vaccine change year-to-year. If attitudes toward seasonal influenza are not stable, there are implications for future vaccine strategies. The most salient being an increased need to focus on education campaigns. Since education can influence attitudes via beliefs and knowledge (Breckler, 1984) this seems to be an important research question moving forward.

Vaccine Status of Direct Supervisors

It would also be interesting to assess the relative impact of front-line employees' knowledge of direct line supervisor vaccine status. Although the knowledge of this information in and of itself is not going to ensure vaccination of staff, I expect that it will add some incremental variance in vaccine uptake. This is based primarily on previous research conducted in the transformational leadership domain. In fact, some healthcare organizations encourage a very public vaccination of their CEO to motivate and

encourage staff to accept vaccine themselves. A greater understanding of the vaccine status of direct supervisors may also impact vaccine uptake and should be investigated in future research.

Linking outcomes from multiple seasonal influenza campaigns

Future research should attempt to clearly link HCW exposure to the champion process so that definitive conclusions can be made with respect to champion exposure. This could be achieved through unique identifiers through the health care organizations internal database (if one exists) and an immediate follow-up evaluation or survey post-intervention.

A semantic differential format was used for the attitude scale across studies 2 and 3. The use of this type of scale did cause some issues when an attempt was made to run a Confirmatory Factor Analysis (CFA) in Study 2. Specifically, the use of this format appeared to cause error terms for items such as “positive” and “negative” or “useful” and “useless” to correlate strongly (co-vary). Future research should attempt to assess HCWs attitudes toward seasonal influenza vaccine using a likert scale with more specific items related to seasonal influenza vaccination (i.e., the flu shot is effective at preventing illness).

Limitations

The impact of normative influences was not supported across the three studies conducted. The potential explanation for this non-effect could be attributed to the relatively poor factor structure of the normative factor. Although psychometric and test

development techniques such as the use of SMEs during construct validation and adaptation of previously validated item sets used in other research, the normative items did not adequately fit the latent factors in the TPB. Although the normative items did not predict intentions to receive seasonal influenza vaccine as anticipated, the relative predictive power of the TPB via attitudes was still supported. This can only add further support for the use of the TPB to explain seasonal vaccine uptake among a HCW population. Another interesting consideration is the potential inability for participants to accurately assess the impact of social norms via survey data as discovered in previous research (Nolan, Schultz, Cialdini, Goldstein & Griskevicius, 2008). One could argue that the presence of a unit champion is in essence a very powerful descriptive (presence of a co-worker whom is vaccinating other co-workers) and injunctive (suggesting seasonal vaccine is the right thing to do) norm.

The follow up champion intervention in Study 3 relies on the assumption that most individuals were exposed to a peer vaccine champion in 2007; however it is possible that some of the employees exposed to a champion in 2008 were not exposed in 2007. Unfortunately it is not possible to link employee codes to determine if this occurred.

Strengths

Although a number of limitations have been identified across the three research studies, there are numerous strengths that should be acknowledged. Subsequent to beginning this dissertation a number of attempts have been made to better understand the behavioural determinants of seasonal influenza vaccination among a HCW population.

For the most part, these studies have been very informative from a qualitative perspective. A recent attempt by Hopman, Riphagen-Dalhuisen, Looijmans-van den Akker, Frijstein et al. (2011) to understand behavioural determinants of vaccine uptake combined a number of theoretical models including the Health Beliefs Model (Rosenstock, 1974), Behavioural Intention Model (Fishbein & Ajzen, 1975) and the Attitude Social influence Efficacy (ASE) model (De Vries, Dijkstra, & Kuhlman, 1988). This research does parallel the current dissertation; however there are a number of major differences. First, Hopman et al (2010) did not ground their research in a unitary conceptual framework which makes interpretation somewhat difficult. Second, the use of self-reported vaccine uptake does not address the intention-behaviour dilemma cited by a number of researchers (Armitage & Conner, 2001).

Finally, it is important to note that both of the participating organizations had a formal and very similar vaccine policy which aids in the comparison of the results presented and does control for possible differences in organizational protocols that have been problematic in previous research assessing factors related to seasonal influenza vaccine among HCWs (Gavazzi, Filali-Zegzouti, Guyon, et al 2011).

Recommendations

Although having a positive attitude toward seasonal influenza vaccine is important, practitioners need to consider other factors due to the very positive attitudes toward seasonal influenza vaccine within this population. Across studies 2 and 3 the mean averages for attitudes toward vaccine was $M = 4.23/5$ and $M = 4.45/5$ respectively. Having attitudes that are positively skewed leaves little opportunity for improvement

(Ajzen, 2011). Based on this reality, I suggest using a multipronged approach when promoting seasonal influenza vaccine. First, continue to promote the importance and usefulness of receiving seasonal influenza vaccine to HCWs. These efforts by the participating organizations have made a substantial difference based on the results of studies two and three. Second, continue to promote seasonal influenza vaccine via peer champions. The success of the peer champion process was supported in Study 1 and the follow up intervention offers support for the continued application of this intervention to support seasonal influenza vaccination among a HCW population. Improving the champion process by focusing on the TPB variables identified in this research is recommended.

Conclusion

This research set out to empirically examine the effectiveness of vaccination champions in a healthcare organization. Results of Study 1 supported the use of vaccination champions to increase seasonal influenza vaccine among a HCW population. Although the champion intervention was successful, further examination of the champion process was conducted in order to identify the psychological predictors and barriers to seasonal influenza vaccination and subsequent vaccine acceptance. Results of studies 2 and 3 partially support the use of the TPB as a conceptual framework to further guide the development of the champion process. A clear link was established to support the utility of the TPB variables when predicting HCW's seasonal influenza vaccine intentions and behaviour. A follow up analysis on a sub-set of HCWs exposed to the peer vaccine

champion in 2008 suggests that elements of the TPB are predictive of intentions and subsequent uptake of seasonal influenza vaccine among a HCW population. The results of this study have important implications for future seasonal influenza vaccination campaigns in healthcare organizations as well as for social psychological research.

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Appendix A: Invitation to unit managers

Dear Managers:

We are once again approaching the time of year when we have our Flu clinics. I have been working with Saint Mary's University on a research study associated with the flu campaign. Your area has been chosen to participate in this project.

To give you a little bit of personal background, last year I was the manager for the PACU's at the QEII. At one of my units, I had an individual who really promoted the Flu campaign within the department; she was very diligent in informing and providing flu immunization to her peers. At the other unit we did not have an individual who was an advocate for the campaign. In the unit where we had the "champion" we had a 50% increase in the immunization rate compared to the unit without the "champion". I was very interested in this finding, so when I assumed the role of Manager of Occupational Health, I thought the use of champions should be implemented throughout the entire organization. I spoke with some individuals from Saint Mary's; they were very interested in conducting this as a research study to obtain scientific data to, in fact, test my hypothesis, before we approach the whole organization with the idea.

This is where I need your help. As stated earlier, your area has been chosen; should you choose to accept, your area will have a "Champion" and I will need the following:

- For you to choose an individual that you see as a leader in your department. They must be someone that co-workers trust, are committed to follow through on the study and willing to promote and encourage co-workers to accept flu immunization. They must also be someone who accepts the flu immunization yearly.
- The manager must allow them to attend one all-day session for training. All champions will be expected to attend the learning day. A tentative date of October 6, 2005 has been set.
- The champion will be permitted to administer (those who are qualified to administer medication) and/or promote the flu immunization program throughout their shifts in their department, while the flu campaign is in place, October 14 to November 4, 2005.

I am asking that you please get back to me with the name of an individual that you feel fits this profile by September 28, 2005.

Thank you in advance for your time, please help by being part of this important research study.

Appendix B: Overview of specific elements of champion training

Topic	Details of Seasonal Influenza Training Element
Introduction	The introduction section included an overview, purpose and description of content within the education package.
Occupational health pledge of confidentiality	All vaccine champions were required to sign an organizational pledge of confidentiality. This form clearly articulated that all personal information obtained via the champion process was to be held in strict confidence. Any disclosure of personal information could be subject to disciplinary action up to and including dismissal by the healthcare organization. This document was designed in compliance with the Statutes of Nova Scotia Hospitals Act.
Learning module for the delivery of influenza vaccine	Individuals that attended the face-to-face training were required to demonstrate proper administration of vaccine via a
Learning module for the treatment of adverse events and anaphylaxis	<p>This section included materials related to possible local, systemic and hypersensitive (allergic) reactions. In addition, any reaction following the improper delivery of vaccine was included in this section.</p> <p>To address the most serious allergic reactions (anaphylaxis) a secondary section was included to (1) identify the symptoms of anaphylactic reactions, (2) understand the step-by-step response to anaphylaxis, (3) understand appropriate treatment of anaphylaxis, and (4) demonstrate competency in documenting and reporting adverse events associated with seasonal influenza vaccination.</p> <p>To demonstrate transfer of learning, a post module evaluation was utilized.</p>
Influenza learning module	<p>Peer champions were introduced to a variety of information that highlighted the importance of vaccinating HCWs, the contents of seasonal influenza vaccine, recommended time to administer seasonal influenza vaccine, and the effectiveness of vaccine.</p> <p>The champions were introduced to common myths and inaccuracies regarding seasonal influenza vaccination (i.e., the vaccine can give you the flu).</p>

Various pieces of literature provided by Department of Health and Wellness-Public Health	This element introduced champions to the expectations from the provincial department of health and wellness. Sections included accountabilities as an immunization provider (reporting of adverse events, management of vaccine, competency, safety, etc.), eligibility of publically funded seasonal influenza vaccine, groups that are considered high-risk for influenza related complications (elderly, those with compromised immune systems, etc.), components of seasonal influenza vaccine product for the 2005 strain, who should not be given seasonal influenza vaccine and other pertinent information for the delivery of vaccine.
Influenza immunization clinics schedule	The times and locations of all seasonal vaccine clinics were included in this element of training to ensure champions could be available for vaccine delivery and that all possible barriers associated with accessibility were removed.
Consent form for administration of the vaccine	A consent form was included to present to all individuals receiving a seasonal influenza vaccination. This form included demographic information, contraindications (severe egg allergy) common side effects associated with seasonal influenza vaccination (e.g., sore arm, and rarely fever), time and location of vaccination. All recipients were advised that the decision to receive a seasonal influenza vaccine is under their control and that the organization did not have a mandatory seasonal influenza vaccination program.
Post training assessment	Following the completion of all modules, an assessment was provided to all peer champions to demonstrate competency with all elements.

Appendix C: Study 2 consent form

STUDY TITLE: Influenza Staff Survey **STUDY SPONSOR:** Saint Mary's University

PRINCIPAL INVESTIGATOR	Steven M. Smith, Ph.D. Dept. of Psychology Saint Mary's University Ph: 902-420-5852 Steven.smith@smu.ca	ASSOCIATE INVESTIGATOR	Jason Slaunwhite, MSc Dept. of Psychology Saint Mary's University ph: 902-401-4234 jasonslaunwhite@eastlink.ca
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INTRODUCTION: You are invited to take part in a research study on influenza vaccination. Taking part in this study is voluntary. Please be assured that your performance evaluation will not be affected by your desire not to participate as all information will be anonymous. Return of the survey will be taken as your consent to participate. The study is described below.

PURPOSE OF THE STUDY: We invite you to participate in our study of Health Care Worker's (HCWs) attitudes and behaviours toward flu vaccination. As you probably know, the flu shot is recommended for all individuals that work in or around the health care system in Canada. Because of this, *name of organization removed* is interested in understanding Health Care Worker's (HCWs) perceptions about the influenza vaccination in order to understand why people do or do not get such vaccinations.

WHO CAN PARTICIPATE IN THIS STUDY? All members of the *name of organization removed* staff can participate.

PROCEDURES OF THE STUDY: Attached you will find a survey concerning your opinions of influenza vaccination. If you consent to do so, please complete the questionnaire and return in the attached envelope. We are interested in your thoughts and feelings as they relate to receiving an annual flu shot. This information will assist us in understanding the issues related to vaccination rates and will add much needed research in the area. Completing the attached survey should only take **15 minutes** of your time.

POSSIBLE BENEFITS, HARMS and DISCOMFORTS: There is no guarantee you will benefit personally by taking part in this study. However, information may be gained that will help in the development of influenza vaccination campaigns, which could benefit staff, patients, and their families. Participation in this study poses no risk of harm or discomfort to you.

COMPENSATION: No compensation is being offered for participation in this study.

CONFIDENTIALITY: All information obtained in this study will be kept strictly **confidential** to SMU. Please be assured that your performance evaluation will not be

affected by your desire not to participate. Questionnaires should be completed anonymously to ensure your responses cannot be identified. Do not record any personal information (except job title) on the survey. Only the SMU research team will have access to the data from this survey and all data will be presented in aggregate form.

QUESTIONS OR PROBLEMS:

If you have any questions, please contact the principal researcher (Dr. Steven M. Smith, 420-5852, steven.smith@smu.ca). This research has been reviewed and approved by the Saint Mary's University Research Ethics Board and the *name of organization removed* Ethics Board. If you have any questions or concerns about the study, you may contact the Chair of the SMU Research Ethics Board Dr. Veronica Stinson at ethics@smu.ca.

Appendix D: Invitation to participate in online survey: Study 2

Dear physician:

Organization name has been providing influenza vaccine to all staff and physicians in the District for the past several years in an effort to prevent or mitigate the effects of influenza on our patient population. Our group, led by Dr. Robert Strang, is interested in finding out why *name of organization removed* staff and physicians do not always avail themselves of this patient safety opportunity.

Please participate in our research study related to the influenza vaccine. Below you will find an in depth explanation of the research and directions to our online survey. This study is being conducted with the support of Saint Mary's University and Nova Scotia Health Promotion and Protection. We thank you in advance for your time and look forward to reviewing you responses.

Appendix E: Information sheet for online survey in Study 2

STUDY TITLE: Influenza Staff Survey **STUDY SPONSOR:** Saint Mary's University

PRINCIPAL INVESTIGATOR:

Dr. Steven M. Smith, Ph.D.
Dept. of Psychology
Saint Mary's University
Ph: 902-420-5852
Steven.smith@smu.ca

ASSOCIATE INVESTIGATOR:

Jason Slaunwhite, MSc
Dept. of Psychology
Saint Mary's University
Ph: 902-401-423
jasonslaunwhite@eastlink.ca

INTRODUCTION: You are invited to take part in a research study on influenza vaccination. Taking part in this study is voluntary. Please be assured that your performance evaluation will not be affected by your desire not to participate as all information will be anonymous. Return of the survey will be taken as your consent to participate. The study is described below.

PURPOSE OF THE STUDY: We invite you to participate in our study of physician's attitudes and behaviours toward flu vaccination. As you probably know, the flu shot is recommended for all individuals that work in or around the health care system in Canada. Because of this, *name of organization removed* is interested in understanding Health Care Worker's (HCWs) perceptions about the influenza vaccination in order to understand why people do or do not get such vaccinations.

WHO CAN PARTICIPATE IN THIS STUDY? All physicians at *name of organization removed* can participate.

PROCEDURES OF THE STUDY: Attached you will find a link to a survey concerning your opinions of influenza vaccination. If you consent to do so, please complete the questionnaire using the link at the bottom of the page. We are interested in your thoughts and feelings as they relate to receiving an annual flu shot. This information will assist us in understanding the issues related to vaccination rates and will add much needed research in the area. Completing the attached survey should only take 10 minutes of your time.

POSSIBLE BENEFITS, HARMS and DISCOMFORTS: There is no guarantee you will benefit personally by taking part in this study. However, information may be gained that will help in the development of influenza vaccination campaigns, which could benefit staff, patients, and their families. Participation in this study poses no risk of harm or discomfort to you.

COMPENSATION: No compensation is being offered for participation in this study.

CONFIDENTIALITY: All information obtained in this study will be kept strictly confidential to SMU. Please be assured that your performance evaluation will not be affected by your desire not to participate. Questionnaires should be completed anonymously to ensure your responses cannot be identified. Do not record any personal information (except generic job title, i.e., nurse, manager, clerk, administrative assistant, etc.) on the survey. Only the SMU research team will have access to the data from this survey and all data will be presented in aggregate form.

QUESTIONS OR PROBLEMS:

If you have any questions, please contact the principal researcher (Dr. Steven M. Smith, 420-5852, steven.smith@smu.ca). This research has been reviewed and approved by the Saint Mary's University Research Ethics Board and the *name of organization removed* Ethics Board. If you have any questions or concerns about the study, you may contact the Chair of the SMU Research Ethics Board Dr. Veronica Stinson at ethics@smu.ca. By filling out this survey it will be considered implied consent.

Please print this page for your records.

If you are interested in participating in this study please visit:

http://www.surveymonkey.com/s.aspx?sm=MuaR6ZBaAH3xN7S2QzBgiA_3d_3d

Appendix F: Perceptions toward influenza vaccine survey

You are invited to participate in the following survey related to the flu shot. More specifically, we would like to ask you a few questions related to your experiences as an employee with Organization A and perceptions toward influenza vaccine.

Please respond to the following items using the following scale. Please take your time and answer as accurately as possible.

Section A:

1	2	3	4	5
Disagree Strongly	Disagree Slightly	Neutral	Agree Slightly	Agree Strongly

1. My family/friends think it is important for me to receive a flu shot.
2. I do not have enough time to receive a flu shot.
3. Receiving a flu shot is important to me.
4. I will be less likely to miss work if I receive a flu shot.
5. The flu shot is not an effective tool to prevent influenza.
6. My supervisor believes that it is important for me to receive a flu shot.
7. Vaccinating health care workers against influenza will increase patient safety.
8. Getting the flu shot will protect me and my family from getting the flu.
9. Getting a flu shot will protect patients from getting the flu.
10. I can become seriously ill from receiving a flu shot.
11. I am able to decide whether or not I receive a flu shot.
12. Health care workers should receive an annual flu shot.
13. My co-workers do not think it is important for me to receive a flu shot.
14. It is my moral responsibility to receive a flu shot each year.

Section B:

In your estimate, what percentage of employees in your unit received a flu shot last year?
_____ %

In your estimate, what percentage of employees receive a flu shot in this organization? _____ %

Please continue to next page

Section C: Please rate on a scale of 1-5 (1 being 'not at all' and 5 being 'definitely') your opinion concerning you getting a **flu shot**:

Positive	1	2	3	4	5
Useless	1	2	3	4	5
Worthless	1	2	3	4	5
Negative	1	2	3	4	5
Effective	1	2	3	4	5
Valuable	1	2	3	4	5
Useful	1	2	3	4	5
Ineffective	1	2	3	4	5

Section D:

D1: In the space below please list any benefits you can think of for **not** getting a flu shot.

D2: In the space below please list any reasons why you would get a flu shot this year.

D3: In the space below please list any barriers that would prevent you from receiving a flu shot.

D4: Did you have a flu shot last year? (Please circle) **Yes** **No**

Please explain why or why not:

D5: Do you plan on getting a flu shot this year? (Please circle) **Yes** **No**

D6: Gender (circle one): a. Male b. Female

D7: My dependents at home include: a. Dependent children b. Elderly relatives
d. None d. Other (Please specify) _____

D8: Department/Organizational Group: _____

Appendix G: Informed consent: Study 3

STUDY TITLE: ATTITUDES TOWARD INFLUENZA VACCINE UPTAKE IN HEALTH CARE WORKERS

RESEARCHERS:

Principal Investigator: Beth Halperin, Canadian Center for Vaccinology, *name of organization removed* Health Centre

Co-Investigators: Jason M. Slaunwhite, Saint Mary's University, Steven Smith, Saint Mary's University, Scott Halperin, Canadian Center for Vaccinology, Robert Strang NS Department of Health Promotion and Protection, Shelly McNeil Canadian Center for Vaccinology, Noni MacDonald Canadian Center for Vaccinology, Assaad Al-Azem NS Department of Health Promotion and Protection and Canadian Center for Vaccinology, Donna Gallant, Canadian Center for Vaccinology

INTRODUCTION: You are invited to take part in a research study on influenza vaccination. Taking part in this study is voluntary. Please be assured that whether or not you participate will not affect your job, position or performance evaluation as all information will be anonymous. Completion of the survey will be taken as your consent to participate. The study is described below.

PURPOSE OF THE STUDY: We invite you to participate in our study of Health Care Worker's (HCWs) attitudes and behaviours toward flu vaccination. As you probably know, the flu shot is recommended for all individuals that work in or around the health care system in Canada. Because of this, the Canadian Center for Vaccinology is interested in understanding Health Care Worker's (HCWs) perceptions about the influenza vaccination in order to understand why people do or do not get such vaccinations.

WHO CAN PARTICIPATE IN THIS STUDY? All members of the *name of organization removed* staff can participate.

PROCEDURES OF THE STUDY: Attached you will find a link to a survey concerning your opinions of influenza vaccination. If you consent to do so, please complete the questionnaire using the link at the bottom of the page. We are interested in your thoughts and feelings as they relate to receiving an annual flu shot. This information will assist us in understanding the issues related to vaccination rates and will add much needed research in the area. Completing the attached survey should only take **15 minutes** of your time.

POSSIBLE BENEFITS, HARMS and DISCOMFORTS: There is no guarantee you will benefit personally by taking part in this study. However, information may be gained that will help in the development of influenza vaccination campaigns, which could benefit staff, patients, and their families. Participation in this study poses no risk of harm or discomfort to you.

COMPENSATION: No compensation is being offered for participation in this study.

CONFIDENTIALITY: All information obtained in this study will be kept strictly **confidential** to the research team. Please be assured that your job, position, or performance evaluation will not be affected by your desire not to participate. Questionnaires should be completed anonymously to ensure your responses cannot be identified. Do not record any personal information (except generic job title, i.e., nurse, manager, clerk, administrative assistant, etc.) on the survey. Only the research team will have access to the data from this survey and all data will be presented in aggregate form.

QUESTIONS OR PROBLEMS:

If you have any questions, please contact the principal researcher (Beth Halperin 902-470-8992, bhalperi@nb.aibn.com). This research has been reviewed and approved by the *name of organization removed* Research Ethics Board. If you have any questions or concerns about the study, you may contact the *name of organization removed* Research Ethics Board at research.ethics@ *name of organization removed*.nshealth.ca.

By filling out this survey and passing it in it will be considered implied consent.

Appendix H: Immunization policy for participating healthcare organization in Studies 1 & 2

Date Issued: July 2011

Applies To: All of *name of organization removed*

This policy applies to all persons who carry on activities within *name of organization removed* including all staff, physicians, volunteers, students (on clinical during influenza season) and independent contractors. The policy does not apply to patients, family or visitors.

This policy is intended for annual influenza immunization. Specific separate guidelines for immunization during an influenza pandemic will be used. *Name of organization removed* Influenza Campaign is held in October and November annually.

POLICY

1. It is strongly recommended that all persons receive an annual influenza vaccination to reduce the incidence and risk of influenza infection to employees, patients and their families.
2. Occupational Health provides a Seasonal Influenza Campaign for all persons who carry on activities within *name of organization removed*.
3. Occupational Health will provide immunization information to Public Health Services as required.

DEFINITIONS

Health Care Provider: A person who provides direct patient care.

High risk persons: Includes but is not limited to adults and children with chronic cardiac or pulmonary disease; adults and children with chronic renal, metabolic or immunosuppressive disease, persons of any age who are residents of nursing homes or chronic care facilities; and people over 65 years of age. For a more complete list see Appendix 1.

Symptoms suggestive of influenza: Sudden onset of fever, headache, myalgia, sore throat, cough, in the context of influenza circulating in the community.

GUIDING PRINCIPLES AND VALUES

1. Influenza is a highly contagious disease of the respiratory tract that may cause severe illness and sometimes fatal complications. Healthcare Providers during the course of their work, have the potential to become ill and transmit influenza to those under their care.
2. "The most effective way to reduce the impact of influenza is to vaccinate persons at high risk, and those capable of transmitting influenza to those at high risk, each year before the influenza season." (1)
3. Protection from the vaccine begins about 2 weeks after immunization and lasts less than one year.
4. Influenza vaccination can prevent illness in 70% -90% of healthy vaccine recipients when the match between strains included in the vaccine and those circulating in the community is close.
5. Influenza vaccine should not be given to persons who have had an anaphylactic reaction to a previous dose of vaccine or with known hypersensitivity to eggs, which is

manifested as hives, swelling of the mouth and throat, difficulty breathing, hypotension and shock.

PROCEDURE

1. All persons who carry on activities within *name of organization removed*

1.1. Provide documentation to Occupational Health if receiving the influenza vaccination at a Family Doctor or community clinic. (See form: (intranet) Administrative forms, Occupational Health dropdown. Titled: Influenza Immunization Received outside of *name of organization removed*

1.2. Bring *name of organization removed* identification (ID) at time of vaccination.

1.3. Promote and comply with influenza immunization to decrease the risk of infection and complications.

1.4. During the influenza season, be vigilant to self-monitor for signs and symptoms of influenza which include the acute onset of respiratory illness with fever and cough and one or more of the following:

1.4.1. sore throat,

1.4.2. muscle aches,

1.4.3. joint pain,

Influenza Vaccination for Employees Page 3 of 5

1.4.4. weakness

Note: In children under 5, gastrointestinal symptoms may also be present. In patients under 5 or 65 and older, fever may not be prominent. (PHAC, 2010) For information on determining the difference between a cold or an influenza refer to the following link: <http://resources.cpha.ca/CCIAP/data/176e.pdf>.

1.5. Remain off work when ill with influenza from the time symptoms begin until symptoms subside. Seek medical attention if no improvement is noted.

2. Occupational Health

2.1. Administer the influenza vaccination, provide counselling, maintain accurate and accessible immunization records, and ensures appropriate confidentiality of information.

2.2. Provide influenza vaccination to new hires at the health assessment appointment (Preplacement) each year during the *ORGANIZATION A* Influenza Campaign (mid Oct. - mid Nov.)

2.3. Inform new employees during hospital orientation of the provision of annual influenza vaccination.

3. Managers

3.1. Promote, among employees, adherence with the influenza vaccination recommendations annually and in particular during outbreak situations.

4. Volunteer Services

4.1. Promote annual influenza immunization to all new and current volunteers

4.2. Volunteer Coordinators inform all new volunteers that they may access the Occupational Health influenza clinics.

People at high risk of influenza-related complications or those more likely to require hospitalization:

Adults and children with the following chronic health conditions:

- cardiac or pulmonary disorders (including bronchopulmonary dysplasia, cystic fibrosis and asthma);
- diabetes mellitus and other metabolic diseases ;
- cancer, immunodeficiency, immunosuppression (due to underlying disease and/or therapy);
- renal disease;
- anemia or hemoglobinopathy;
- conditions that compromise the management of respiratory secretions and are associated with an increased risk of; and children and adolescents with conditions treated for long periods with acetylsalicylic acid.
- People of any age who are residents of nursing homes or other chronic care facilities.
- People 65 years of age or older.
- Healthy children 6 to 23 months of age.
- Pregnant women (the risk of influenza-related hospitalization increases with length of gestation, i.e. it is higher in the third than in the second trimester).

People capable of transmitting influenza to those at high risk

- Health care and other care providers in facilities and community settings who, through their activities, are capable of transmitting influenza to those at high risk of influenza complications.
- Household contacts (adults and children) of individuals at high risk of influenza-related complications (whether or not the individual at high risk has been immunized):
- Household contacts of infants less than 6 months of age who are at high risk of complications from influenza but for whom influenza vaccine is not authorized.
- Members of a household expecting a newborn during the influenza season.
- Those providing regular child care to children less than 24 months of age, whether in or out of the home.
- Those who provide services within closed or relatively closed settings to persons at high risk (e. g. crew on a ship).

Others

- People who provide essential community services.
- People in direct contact during culling operations with poultry infected with avian influenza.

- Note: Healthy persons aged 5 to 64 years without contraindication are also encouraged to receive influenza vaccine even if they are not in one of the priority groups.

Appendix I: Immunization policy for participating healthcare organization in Study 3

Responsibility of: Occupational Health & Safety Department

Effective Date March 1, 2000

Last Review: N/A **Next Review:** March 1, 2002

Target Audience: Employees

Approved by Members of the Senior Management Team

A. POLICY:

As a pre-employment or ongoing health review, all health centre employees will have a record of the following:

- History of Childhood/Infectious Diseases,
- Previous Immunizations,
- Results of any related Serology Immunity Testing.
-

Where there is an identified non immune status to a vaccine preventable illness then the employee will be offered the appropriate vaccination. Employees who refuse the recommended vaccine will have the risk of transmission of infection to and from the patient/employee reviewed by the Occupational Health Physician. Following a review of all pertinent information, the Occupational Health Physician will make a recommendation as to whether the employee is:

- fit to work;
- fit to work with restrictions; and/or
- not fit to work

Fitness to work is defined as being able to perform the essential requirements of the job.

In all cases where the employee does not meet the “fit to work” standard the recommendation will be communicated by the Occupational Health Physician to the employee, the Director of Human Resources and the employee’s manager.

B. PURPOSE:

To protect employees against diseases that they may be exposed to in the workplace or that the employee may acquire and inadvertently expose the patient, especially where the patient is immune compromised.

To minimize or eliminate unnecessary work restrictions with the optimal use of vaccines for potentially preventable diseases.

To serve as a baseline for determining whether future diseases are work related.

C. PROTOCOL:

History of Childhood/Infectious Diseases

All employees will provide a History of Childhood/Infectious Diseases, in particular, past history of Rubella, Rubeola, Chickenpox and Mumps.

Serology

Where there is no history of a relevant infectious disease the employee will have serological testing.

Immunization

Employees, where possible, will provide a detailed immunization history.

- **Rubella/Rubeola**
Employees who test non-immune to rubella and/or rubeola and are not pregnant should be vaccinated.
- **Mantoux Testing 5TU PPD**
All new employees will receive a Mantoux test unless otherwise indicated. A follow up chest x-ray will be done on those who have reactions of greater than 10 mm or conversion to Mantoux test result of induration greater than 10 mm.
- **Hepatitis A**
Hepatitis A vaccine will be offered to the employees of the Children's Response Program.
- **Hepatitis B**
Hepatitis B vaccine will be offered to all health centre employees who have a significant exposure to blood and bloody body fluids in the workplace. All employees will have serological testing at the completion of the vaccine series to establish antibody response and the need for re-immunization if the first course failed to provide protection. These results will be provided to the tested person. Those who fail to seroconvert following the

second series will need passive immunization after potential exposure to Hepatitis B.

Where an employee is assessed as having a high risk occupation but did not have serological testing within the 1-6 month recommended period but is tested later and is determined to be non-immune then a booster will be recommended. Where there is failure to seroconvert following the booster a complete repeat series will be offered.

Where there is failure to seroconvert following the booster series the employee will be counselled and the workplace risk evaluated.

- **Hepatitis B Immune Globulin**
Hepatitis B Immune Globulin will be offered following an exposure to an HBsAg positive source and an HBAb non-immune worker.
- **Influenza Vaccination Annually,(in October),** an Influenza vaccination, will be offered, as recommended by the NS Department of Health to all employees, especially those who have contact with high risk groups.
- **Tetanus Diphtheria**

The recommended adult booster is every 10 years. This should be administered by the family physician. In the case of a workplace injury and where the employee has not received Tetanus Diphtheria in the previous 10 year period, it will be given by the Occupational Health Nurse.

- **Varicella Vaccine**
Employees who have no history of chickenpox and subsequently have no serological evidence of immunity to varicella virus, are neither pregnant, immune compromised or allergic to neomycin, should be vaccinated. Two 0.5 ml doses of vaccine will be administered subcutaneously 4 - 8 weeks apart. Immediately following an exposure to varicella, employees who have received Varivax will be tested for varicella immunity. Those who do not have detectable antibody will be monitored daily to determine clinical status and put off work at the onset of manifestations of varicella.

D. SUPPLEMENTAL REFERENCES:

Red Book, Twenty Ninth Edition 1997, Report of the Committee on Infectious Diseases.

Canadian Immunization Guide, Fifth Edition 1998, Health Protection Branch,
Laboratory
Centre for Disease Control.
Canadian Tuberculosis Standards Fourth Edition 1996 Canadian Lung
Association.
Revised Guidelines for Booster Vaccination Against Hepatitis B.



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Research Ethics Board Certificate Notices

Saint Mary's University Research Ethics Board has issued an REB certificate related to this thesis. The certificate number is: 07-133.

A copy of the certificate is on file at:

Saint Mary's University
Patrick Power Library-Archives
923 Robie St.
Halifax, NS B3H 3C3

Email: archives@smu.ca

Phone: 902-496-8750

Fax: 902-420-5561

Also on file is a copy of the REB certificate from the Capital Health Research Ethics Board.

File #: CDHA-RS/2005-222