

A RETROSPECTIVE REVIEW OF THE SCHOOL-BASED
HUMAN PAPILLOMAVIRUS (HPV) IMMUNIZATION PROGRAM:
EVALUATING THE EFFECTS OF PUBLIC HEALTH NURSING
ENGAGEMENT STRATEGIES WITH SCHOOLS, PARENTS AND YOUTH
ON HPV VACCINE UPTAKE IN GREATER HALIFAX

by

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Submitted in partial fulfilment of the requirements
for the degree of Master of Nursing

at

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DALHOUSIE UNIVERSITY

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TABLE OF CONTENTS

LIST OF TABLES	vi
LIST OF FIGURES.....	vii
ABSTRACT	viii
LIST OF ABBREVIATIONS USED	ix
ACKNOWLEDGEMENTS.....	x
CHAPTER 1 INTRODUCTION	1
GOALS AND OBJECTIVES	4
BACKGROUND	5
CONCEPTUAL FRAMEWORK.....	16
CHAPTER 2 LITERATURE REVIEW	23
HUMAN PAPILLOMAVIRUS (HPV) VACCINE ACCEPTABILITY AND ADHERENCE	23
SCHOOL-BASED IMMUNIZATION INTERVENTIONS AND STRATEGIES	35
CRITIQUE OF THE EVIDENCE.....	42
CHAPTER 3 METHODOLOGY	45
GOALS AND OBJECTIVES	45
SETTING	46
MODEL OF IMMUNIZATION DELIVERY	48
POPULATION	49
SAMPLE SIZE CALCULATION	50
MEASURES	51
STUDY VARIABLES.....	54
PROCEDURES.....	56
SURVEY RECRUITMENT	57
DATA ANALYSIS.....	58
ETHICAL CONSIDERATIONS	61
CHAPTER 4 RESULTS	64
NURSE PARTICIPANT CHARACTERISTICS	64
ELIGIBLE STUDENT PARTICIPANTS IN THE HPV IMMUNIZATION PROGRAM.....	66
UPTAKE OF THE HPV VACCINE IN STUDY PARTICIPANTS	67
STRATEGIES USED BY PHNs IN THE HPV IMMUNIZATION PROGRAM.....	68
MULTINOMINAL LOGISTIC REGRESSION MODEL	70
CHAPTER 5 DISCUSSION.....	79
ENGAGEMENT STRATEGIES AS STANDARD PRACTICE	79
ENGAGEMENT OF PARENTS	80
ENGAGEMENT OF SCHOOLS	82
YOUTH ENGAGEMENT	85
THE VACCINE PERCEPTIONS, ACCEPTABILITY AND ADHERENCE MODEL.....	86
STUDY LIMITATIONS	88
FUTURE IMPLICATIONS	90
REFERENCES	95

<i>APPENDIX A</i>	110
SCHOOL-BASED IMMUNIZATION ENGAGEMENT INTERVIEW GUIDE AND QUESTIONNAIRE	110
<i>APPENDIX B</i>	113
LETTER OF INVITATION TO PARTICIPATE IN THE STUDY	113
<i>APPENDIX C</i>	114
CONSENT FORM.....	114
<i>APPENDIX D</i>	121
VARIABLES INCLUDED IN STUDY: NURSING ENGAGEMENT STRATEGIES AND HPV VACCINE UPTAKE ...	121
<i>APPENDIX E</i>	125
COPYRIGHT RELEASE	125

LIST OF TABLES

TABLE 1 TRANSITION OF SCHOOL-BASED IMMUNIZATION PROGRAM, CAPITAL HEALTH, 2006 TO 2010.....	9
TABLE 2 INDEPENDENT VARIABLE PREDICTORS OF HPV VACCINE UPTAKE	55
TABLE 3 DEMOGRAPHIC CHARACTERISTICS OF NURSE PARTICIPANTS	65
TABLE 4 CHARACTERISTICS OF ELIGIBLE STUDENT PARTICIPANTS	66
TABLE 5 HPV UPTAKE FOR ELIGIBLE PARTICIPANTS: INCLUDED SCHOOLS VS. EXCLUDED SCHOOLS.....	67
TABLE 6 CHARACTERISTICS OF ELIGIBLE STUDENT PARTICIPANTS AND HPV UPTAKE	68
TABLE 7 A RANKING OF STRATEGIES BY PERCENT USED WITH STUDENTS BY PHNS IN SCHOOLS	70
TABLE 8 EXCLUDED VARIABLES FROM NURSING QUESTIONNAIRE.....	71
TABLE 9 STRATEGIES USED IN SCHOOLS AS 'STANDARD PRACTICE'	72
TABLE 10 FINAL MULTINOMINAL LOGISTIC REGRESSION MODEL FOR PUBLIC HEALTH NURSING ENGAGEMENT STRATEGIES AND UPTAKE OF THE HPV VACCINE IN A SCHOOL-BASED IMMUNIZATION PROGRAM.....	73
TABLE 11 STRATEGIES SHOWN TO SIGNIFICANTLY IMPROVE HPV VACCINE INITIATION AND COMPLETION.....	77

LIST OF FIGURES

FIGURE 1 UPTAKE OF THE HPV VACCINE IN SCHOOL-BASED IMMUNIZATION PROGRAM, NOVA SCOTIA, 2007-2009	11
FIGURE 2 THE VACCINE PERCEPTIONS, ACCEPTABILITY AND ADHERENCE MODEL.....	20
FIGURE 3 FLOW CHART OF SURVEY RECRUITMENT AND INCLUSION OF STUDY PARTICIPANTS.....	58
FIGURE 4 HISTOGRAM OF STRATEGIES USED WITH STUDENTS BY PHNS IN SCHOOLS.....	69
FIGURE 5 HISTOGRAM SHOWING UPTAKE OF AT LEAST ONE DOSE OF HPV VACCINE BY ‘REMINDER CALLS FOR CONSENT RETURN’	74
FIGURE 6 HISTOGRAM SHOWING UPTAKE OF AT LEAST ONE DOSE OF HPV VACCINE BY ‘REMINDER CALLS FOLLOWING A MISSED CLINIC’	74
FIGURE 7 HISTOGRAM SHOWING UPTAKE OF AT LEAST ONE DOSE OF HPV VACCINE BY ‘HPV HEALTH EDUCATION SESSION TO TEACHERS’	75
FIGURE 8 HISTOGRAM SHOWING UPTAKE OF AT LEAST ONE DOSE OF HPV VACCINE BY ‘THANK-YOU TO TEACHER’	76
FIGURE 9 HISTOGRAM SHOWING COMPLETE UPTAKE OF THE HPV VACCINE BY ‘CONSENT RETURN TO STUDENTS’ TEACHER’	76
FIGURE 10 HISTOGRAM SHOWING COMPLETE UPTAKE OF THE HPV VACCINE BY ‘PHN ASSIGNED TO SCHOOL’	77
FIGURE 11 HISTOGRAM OF STRATEGIES USED IN SCHOOLS SHOWN TO SIGNIFICANTLY IMPROVE HPV VACCINE INITIATION AND COMPLETION.....	78
FIGURE 12 VACCINE PERCEPTIONS, ACCEPTABILITY AND ADHERENCE MODEL (REVISED).....	87

ABSTRACT

BACKGROUND: Nova Scotia has the highest rate of cervical cancer, predominantly attributed to the Human Papillomavirus (HPV). In 2007, the HPV vaccine was approved and a successful school-based program was implemented. Little is known however, which strategies used by public health nurses (PHNs) helps improve vaccine uptake.

METHODS: A retrospective, exploratory correlation study examined the relationship between school-based PHN strategies, and uptake of HPV vaccine.

RESULTS: HPV vaccine initiation was significantly associated with PHNs providing reminder calls for: consent return ($p = .017$) and missed school clinic ($p = .004$); HPV education to teachers ($p < .001$), and a thank-you to teachers ($p < .001$). Completion of the HPV series was associated with consents being returned to the students' teacher ($p = .003$), and a PHN being assigned to a school ($p = .025$).

CONCLUSIONS: These findings will help guide PHN's best practice for optimal uptake of the HPV vaccine.

LIST OF ABBREVIATIONS USED

ANDS	Application for Notifiable Disease Surveillance
AVSB	Annapolis Valley School Board
CIC	Canadian Immunization Committee
CDC	Centres for Disease Control
CNA	Canadian Nursing Association
CSAP	Conseil Scolaire Acadien Provencial
GSK	GlaxoSmithKline
HBM	Health Belief Model
HBV	Hepatitis B Vaccine
HPV	Human Papillomavirus
HRM	Halifax Regional Municipality
HRSB	Halifax Regional School Board
KT	Knowledge Translation
LPN	Licensed Practical Nurse
MenC	Meningococcal group C conjugate vaccine
MMR	Measles, mumps, rubella vaccine
MSM	Males who have sex with males
MOU	Memorandum of Understanding
NACI	National Advisory Committee on Immunization
NS	Nova Scotia
PEI	Prince Edward Island
PHAC	Public Health Agency of Canada
PHN	Public Health Nurse
RNAO	Registered Nurses Association of Ontario
STIs	Sexually transmitted infections
Tdap	Tetanus, diphtheria and pertussis booster vaccine
VAR	Varicella zoster vaccine
US	United States of America
WHO	World Health Organization
YHC	Youth Health Centre

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Chapter 1 Introduction

The human papillomavirus (HPV) vaccine represents one of the most important mechanisms in cervical cancer prevention (Steben, 2007). In 2007, Nova Scotia was one of four Canadian provinces (along with Ontario, Prince Edward Island and Newfoundland) to launch the HPV vaccination program in response to the high rates of cervical cancer (Canadian Cancer Society, 2011; National Advisory Committee on Immunization [NACI], 2012). Globally, each year almost half a million women develop cervical cancer, of which more than half will die (World Health Organization [WHO], 2010). In 2011, an estimated 1300 Canadian women were diagnosed with cervical cancer, and 350 died as a result of the disease; Nova Scotian women suffer from the highest rate of cervical cancer in the country (Canadian Cancer Society, 2011). Furthermore, cervical cancer incidence and mortality disproportionately affect people in accordance to their race, income, education, and other socio-demographic factors (Bryer, 2010; Hughes et al., 2009; Roberts et al., 2011).

There is a vast range in HPV vaccine uptake between regions, with more successful uptake in areas with school-based immunization programs in place (European Cervical Cancer Association, 2009; Kessels et al., 2012). In the United States (US) and France for example, where the typical delivery method is through primary care providers, complete vaccine uptake (i.e., the completion of three doses of HPV vaccine) averages 32.0% and 23.7% respectively (Centers for Disease Control and Prevention [CDC], 2011; Fagot, Boutrelle, Ricordeau, Weill, & Allemand, 2011). In the United Kingdom (UK), Australia and Canada, where school-based immunization programs have been implemented for the HPV vaccine, rates of coverage range from 64 to 80% (CDC, 2011;

Immunize Australia Program, 2011). Despite having a school-based immunization program, Canada is variable with respect to the success of its HPV vaccine programs, with most provinces and territories falling well below the national target, to immunize 80% of school-aged girls within two years of program introduction (Canadian Immunization Committee, 2007). For example, Ontario reported an initial uptake of 51% in the first year of the program (CDC, 2011), while Nova Scotia reported uptake of 79.7% (D. Mombourquette, Immunization Coordinator, Nova Scotia Department of Health and Wellness, personal communication, May 11, 2012).

While parental and adolescent factors impacting the uptake of the HPV vaccination program for adolescents have been well studied (Agius, Pitts, Smith, & Mitchell, 2010; Brabin et al., 2008; Kessels et al., 2012; Ogilvie et al., 2010), there is limited research investigating the role public health nurses (PHNs) play (e.g., relationship with schools, engaging parents, adolescents and school personnel), in promoting HPV vaccine uptake and completing the three dose series (Brabin, Roberts, & Kitchener, 2007; Brabin et al., 2008; Brabin et al., 2011; Cooper Robbins, Bernard, Brotherton, McCaffery, & Skinner, 2010; Hilton, Hunt, Beford, & Petticrew, 2011; Stretch et al., 2009; Watson, Shaw, Molchanoff, & McInnes, 2009; Wilson, Karas, Crowcroft, Bontovics, & Deeks, 2012).

Best practice strategies employed by PHNs specifically to provide successful school-based HPV immunization campaigns (i.e., to immunize at least 80% of the target population) were only examined in a few studies (Mak, Bulsara, Goggin, & Effler, 2011; Hilton et al., 2011), even though school-based vaccine delivery is an optimum platform to achieve high adolescent immunization coverage (Cawley, Hull & Rousculp, 2010; Painter

et al., 2011). Mak, Bulsara, Goggin, and Effler (2011) found that the only strategy that significantly improved HPV vaccine consent return was resending a consent information package home with a student who had not returned a consent form. Strategies that did not significantly improve HPV vaccine consent return rate included: a standard reminder letter, a standard reminder phone call, and an incentive (movie passes or \$200 educational gift voucher) for schools with greater than 90% return rate (Mak et al., 2011). In another study, Hilton, Hunt, Beford, and Petticrew (2011) explored nurses' perspectives of the HPV vaccination program and found that PHNs utilized different strategies depending on their assessment of parents' decision-making. The study did not examine differences in uptake of the vaccine based on different strategies used by the nurses (Hilton et al., 2011).

Despite the paucity of research findings, we do know that other structural and socioeconomic factors such as geographic location, ethnicity, and education level also impact HPV vaccine uptake (Brabin et al., 2008; Hughes et al., 2009; Kessels et al., 2012). There is also evidence to support that school-based immunization programs can help bridge the gap in sociocultural disparities (European Cervical Cancer Association, 2009; Federico, Abrams, Everhart, Melinkovich, & Hambidge, 2010; Gottvall, Tyden, Larsson, Stenhammar, & Høglund, 2011). With this in mind, nurses working in school-based immunization programs require more robust evidence to help guide best practice for public health nursing strategies and interventions related to the HPV vaccination program specifically.

The proposed study will explore the impact of PHN strategies and interventions, (such as parent information sessions, teacher recruitment in consent package distribution, and student involvement in peer health promotion) on the uptake of school based

immunization HPV vaccination of adolescent girls in the greater Halifax area. In particular, this study will retrospectively examine the relationship between PHN-led youth engagement, parent/guardian engagement and school engagement within a cervical cancer health promotion campaign, and vaccine refusal, initiation and completion of the three-dose HPV vaccination series. It is anticipated that for schools in which public health nurses were successful in engaging youth and youth-led health promotion activities occurred, there will have been higher rates of completion of the HPV vaccination series.

Goals and Objectives

The purpose of this retrospective, exploratory correlation study is to examine the relationship between HPV vaccine refusal (no vaccine), uptake (one to two doses) and adherence (completion of three doses) of adolescent girls in a school-based HPV vaccination program and PHN-led strategies for the years 2010-2011. More specifically, the objectives will include:

1. To explore activities and strategies utilized in PHNs' practice in fostering youth, parental and school engagement in the HPV Immunization Program;
2. To examine the effect of youth, parental and school engagement activities on vaccine refusal, initiation, and completion of the three doses of the HPV vaccination series; and
3. To enhance the knowledge of PHNs in identifying strategies to increase vaccine uptake in school based vaccination programs.

Background

HPV and cervical cancer. HPV infection is the most common viral sexually transmitted infection (STI), and is primarily transmitted by skin-to-skin contact (Money & Provencher, 2007). HPV is capable of causing benign and malignant disease of the anogenital tract, as well as in the head and neck (NACI, 2007; Money & Provencher 2007). External genital warts, cervical dysplasia and cancer are the potential consequences of genital infection with HPV (Money & Provencher, 2007). HPV strains 16 and 18 contribute to 70% of cervical cancer (Health Canada, 2002), and HPV 6 and 11 cause 80% to 90% of genital warts (Money & Provencher, 2007).

In Canada, HPV is not a reportable disease, making it difficult to determine the true burden of disease among the different populations and regions (Public Health Agency of Canada [PHAC], 2010). Tricco, Ng, Gilca, Anonychuk, Pham & Berliner (2011), who conducted a systematic review and meta-analysis of thirty HPV vaccine related studies and 21 companion reports, found that the Canadian oncogenic HPV prevalence was highest among females less than 20 years of age, and for HPV types 16, and 18, both of which are preventable with the licensed vaccines, Gardasil® and Cervarix™. The combined cervical cancer prevalence for these two strains was 65.9% (Tricco et al., 2011). A provincial population-based study by Moore et al. (2009) of 4821 women (aged 13 to 86 years of age) participating in the provincial cervical cancer screening program in British Columbia, found the overall HPV prevalence to be 16.8%, and was most common in women under 20 years of age as well.

Tricco et al. (2011) also found that socially disadvantaged individuals, specifically those living in low-income, inner-city areas or Aboriginal communities, had the greatest

HPV prevalence. This was further supported in a review by Graham and Mishra (2011) that highlighted the availability of screening services does not always translate into accessibility for those that are marginalized. They further noted that cervical cancer is higher among minority and indigenous women in high-income countries, such as Canada, due to poverty, language barriers, insufficient knowledge, lack of trust in health services, and shame and embarrassment surrounding STIs and gynecological examinations (Graham & Mishra, 2011).

Prevention of HPV and cervical cancer. Prevention of cervical cancer can be targeted from a primary or secondary prevention strategy.

Cervical Cancer Screening. Cervical cancer prevention has historically consisted mainly of Papanicolaou (Pap) smear screening for the early detection of cervical dysplasia prior to the development of carcinoma and has reduced the incidence of cervical cancer deaths by 70% since its introduction in the 1950s (Murphy & Howlett, 2007). Cervical cancer screening is a successful secondary prevention measure when the service is universally accessible, however, the Canadian Cancer Society (2012) estimates that 12% of Canadian women have never been screened. In Nova Scotia, only two thirds of women report receiving a pap test within 3 years (NACI, 2007).

Human Papillomavirus Vaccine. There are currently two licensed vaccines available to Canadians, Gardasil® and Cervarix™, both of which provide protection against cervical cancer HPV types 16 and 18. The quadravalent HPV vaccine, Gardasil®, also protects against external genital warts, HPV types 6 and 11, and was licensed in Canada in July 2006 (Health Canada, 2006). Gardasil® has been administered in the school-based HPV immunization program for female adolescents in

Canada since 2007. The bivalent HPV vaccine, Cervarix™, was licensed in Canada in October 2010 (Health Canada, 2010), and recommendations for use were published in 2012 (NACI, 2012). Both vaccines have now been recommended for females age 9 to 26 years of age (NACI, 2012). Gardasil® has also been recommended for males 9 to 26 years of age, and males who have sex with males (MSM) over 9 years of age (NACI, 2012).

The HPV immunization program. The 2007 Federal budget provided funding to provinces and territories to support the launch of the HPV Immunization Program in Canada in the fall of 2007 for adolescent girls. Four Canadian provinces implemented a school-based program in the first year of this Federal initiative including Nova Scotia, Ontario, PEI and Newfoundland; all the other provinces and territories implemented the program in 2008 (Canadian Immunization Committee, 2007; NACI 2012; PHAC, 2010). Each jurisdiction implemented the publicly funded immunization program considering the factors outlined in the Erikson framework (2003), an analytical framework to guide immunization program planning in Canada. Using this framework, jurisdictions must consider a number of factors in deciding to launch an immunization program such as economic considerations, local programmatic considerations (i.e., already established immunization programs and fit), regional epidemiological data, societal factors (i.e., acceptability of the vaccine) and other factors (Erikson, 2003; Canadian Immunization Committee, 2007). Having the highest rates of cervical cancer in the country was pivotal in launching the program in Nova Scotia in the first year of the HPV vaccine program (D. Mombourquette, Immunization Coordinator, Nova Scotia Department of Health and Wellness, personal communication, May 11, 2012).

In Nova Scotia, a comprehensive school-based immunization program is provided by PHNs in schools targeting a number of vaccine preventable diseases in the adolescent population. With the introduction of the HPV vaccine into the routine vaccine adolescent schedule in 2007, the school-based immunization program has since evolved to target grade 7 students, where previously it was delivered to grade 4 and grade 10 students. Immunization campaigns that are developed in response to infectious disease outbreaks (such as the pandemic influenza H1N1 outbreak) are often delivered in schools in conjunction with the routine adolescent schedule (Table 1). The vaccines provided in the comprehensive school-based program include: hepatitis B vaccine (HBV), tetanus, diphtheria and pertussis booster (Tdap), HPV for girls only, and a catch-up program for meningococcal group C (MenC) conjugate vaccine (Capital Health, 2010).

Table 1 Transition of School-Based Immunization Program in Capital Health, 2006 to 2010

School Year	Grade	Immunizations Provided
2006-2007	Grade 4	hepatitis B vaccine (HBV) meningococcal C conjugate vaccine (Men C) varicella zoster vaccine (VAR)
	Grade 10	tetanus, diphtheria, acellular pertussis (Tdap) meningococcal C conjugate vaccine (Men C)
2007-2008	Grade 7	human papillomavirus vaccine (HPV) for girls only tetanus, diphtheria, acellular pertussis (Tdap) meningococcal C conjugate vaccine (Men C)
	Grade 10	tetanus, diphtheria, acellular pertussis (Tdap) meningococcal C conjugate vaccine (Men C)
	Grade 12	measles, mumps, rubella (MMR)
2008-2009	Grade 7	human papillomavirus vaccine (HPV) for girls only tetanus, diphtheria, acellular pertussis (Tdap)
	Grade 10	tetanus, diphtheria, acellular pertussis (Tdap) meningococcal C conjugate vaccine (Men C)
2009-2010	Grade 7	program on hold due to pandemic influenza H1N1
	Grade 10	tetanus, diphtheria, acellular pertussis (Tdap) meningococcal C conjugate vaccine (Men C) human papillomavirus vaccine (HPV) for girls only*
	Grade 10 through 12	pandemic H1N1 influenza vaccine
2010-2011	Grade 7	human papillomavirus vaccine (HPV) for girls only tetanus, diphtheria, acellular pertussis (Tdap) hepatitis B vaccine (HBV) meningococcal C conjugate vaccine (Men C)
	Grade 8	human papillomavirus vaccine (HPV) for girls only tetanus, diphtheria, acellular pertussis (Tdap)

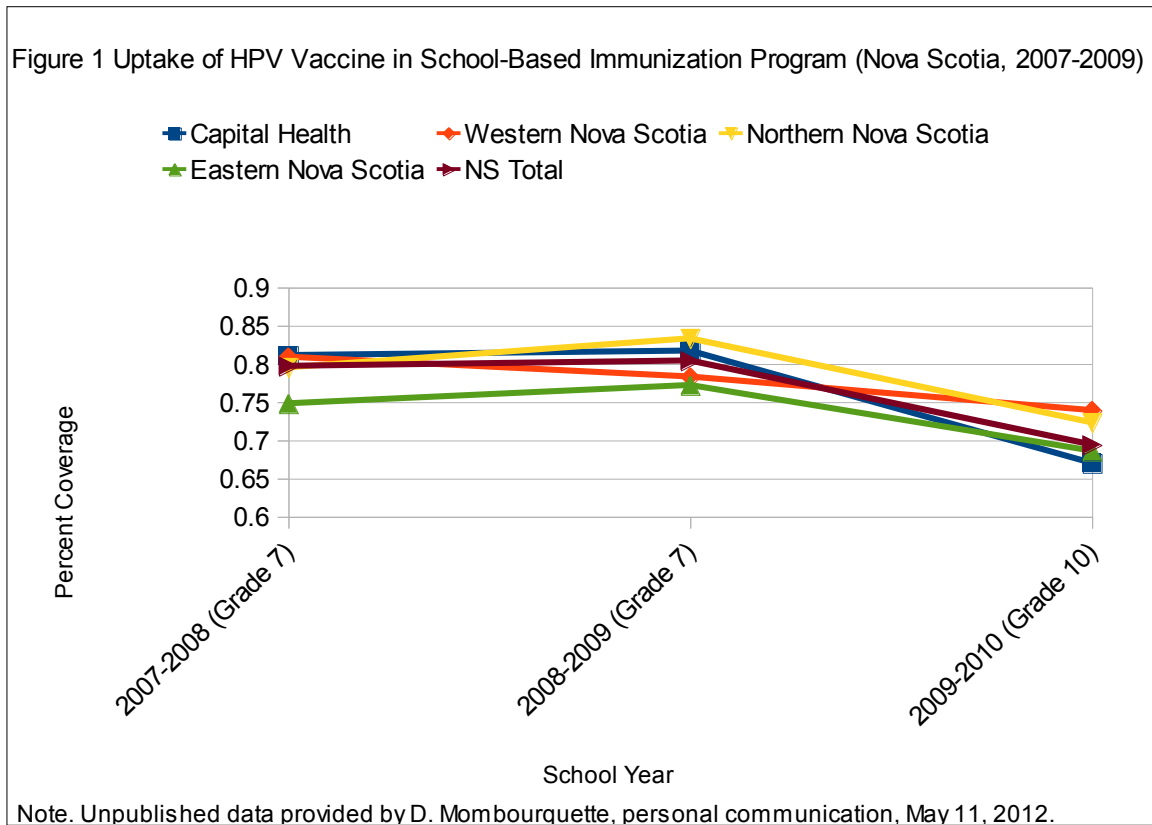
Note. Adapted from "School Immunization Schedule," by Nova Scotia Government, 2007-2010. In the fall of 2009, Nova Scotia launched an immunization campaign in response to the pandemic influenza H1N1, and changes to the routine school-based program resulted. The grade 7 program was put on hold and the grade 10 catch-up program was delivered although had interruptions in the series due to student absenteeism and the need for school-based influenza clinics.

*HPV vaccine for grade 10 female students was a catch-up program for one-year only

The school-based HPV immunization program in Nova Scotia has been successful in reaching the national targets for HPV vaccine uptake in the adolescent cohort at grade 7 in the first two years of the program. In 2007, uptake ranged from 74.8% to 81.1% for

the completion of three doses of the vaccine, giving a provincial rate of 79.7% (D. Mombourquette, Immunization Coordinator, Nova Scotia Department of Health and Wellness, personal communication, May 11, 2012). There was a slight improvement in uptake in the following year, with a range of 77.2% to 81.7% in 2008, and an overall provincial rate of 80.4% (D. Mombourquette, Immunization Coordinator, Nova Scotia Department of Health and Wellness, personal communication, May 11, 2012). A catch-up program was offered to female students in the grade 10 cohort in 2009, although uptake was less than anticipated at a range of 67% to 73% (D. Mombourquette, Immunization Coordinator, Nova Scotia Department of Health and Wellness, personal communication, May 11, 2012). It is important to note however, that at the time the catch-up program was offered, the province and the country were engaging in a mass immunization campaign in response to the influenza H1N1 pandemic (Figure 1).

Figure 1 Uptake of the HPV Vaccine in School-based Immunization Program, Nova Scotia, 2007-2009



Significance of the study - description of the problem. PHNs have delivered the school-based immunization program in Nova Scotia for many years with minimal empirical evidence to guide which strategies and interventions are most effective to improve the uptake of childhood and adolescent vaccines. The nature of public health nursing work, in particular as it relates to immunization programs and practice, is poorly understood by other health care providers, government officials and policy makers (Meagher-Stewart, Aston, Edwards, Smith, Young, & Woodford, 2004). Strategies used in HPV immunization programs have focused primarily on increasing parental acceptance of the vaccine (Davis et al, 2004; Dempsey, Zimet, Davis, & Koutsky, 2006;

Mak et al., 2011; Stretch et al., 2008; Wilson, Barakat, Vohra, Ritvo, & Boon, 2008). The role of the PHN engaging with schools has been explored in only a few studies (Brabin et al., 2011; Cooper Robbins et al., 2010; Hilton et al., 2011). There is limited evidence in the literature regarding youth engagement in evaluating immunization programs (Brabin et al., 2010; Hammer et al., 2009; Guajardo et al., 2002; Kahn et al., 2008; Tung & Middleman, 2005; Vallely, Roberts, Kitchener, & Brabin, 2008), however youth engagement strategies have been employed successfully in targeting other health behaviours such as tobacco reduction and reducing health disparities (Registered Nursing Association of Ontario, 2009). To realize the opportunity of adolescent immunization against HPV and the reduction of cervical cancer, nurses, other health professionals and school personnel require further exploration of the strategies and initiatives that may be employed to improve uptake of the vaccine to reach our national targets. This study provides an opportunity to examine whether engaging youth in immunization program activities will increase uptake of the vaccine and ultimately, successful delivery of the immunization programs (i.e., achieving a minimal of 80% immunization coverage rate) as well as examining the role of PHNs in engaging with families and schools in developing trust in public health programs. This study is also an opportunity to develop a deeper understanding of innovative strategies that nurses employ in working within an adolescent immunization program and to determine the impact of these strategies on uptake of a vaccine to prevent HPV infection and cervical cancer, and to promote trust in vaccine delivery. Specifically, this study will examine the relationship between public health nursing strategies used to engage youth, parents/guardians and schools in a school-based HPV immunization program and the completion of the three-dose series.

A need to protect confidence and public trust in Public Health immunization programs. Vaccine safety concerns have been highlighted as the number one barrier in parental acceptability of the HPV vaccine (Black et al., 2009, Ogilvie et al., 2007; Kessels et al., 2012; Zimet et al., 2006), and among concerns raised in studies of adolescents' perspectives of the HPV vaccine (Caskey, Tessler Lindau, & Alexander, 2009; Di Giuseppe, Abbate, Liguori, Albano, & Angelillo, 2008). These concerns expressed by both parents and adolescents are not surprising, given that Abdelmutti and Hoffman-Goetz (2009), in a content analysis of Canadian and US national newspaper articles about the HPV vaccine, highlighted that the vaccine was “poorly understood by science”. The authors found an emerging theme of pharmaceutical presence in media coverage, along with a progressively negative emotional public tone, all of which could certainly impact HPV risk perception, understanding, and ultimately, uptake of the vaccine. An understanding of risk perception, risk management and safety assessment has been highlighted by experts in the field as critical to ensuring public confidence in our vaccine system (MacDonald, Smith, & Appleton, 2011). This situation is further compounded by ineffective and inconsistent HPV vaccine/consent information and processes across Canada, including within Nova Scotia (Steenbeek, MacDonald, Downie, Appleton, & Baylis, 2011), which ultimately may deter parents from assenting their children to receiving the HPV vaccination. Efforts are needed to improve informed consent, especially since PHNs play an important role in building confidence and public trust in public health programs, including the HPV immunization program. In a study of PHNs perceptions of their roles in fostering citizen participation in Nova Scotia, Aston, Meagher-Stewart, Edwards, and Young (2009), found that nurses built capacity for

citizen engagement through working within a population health promotion perspective, building trusting relationships and rapport, building personal confidence and skills, and engaging in empowering educational strategies.

Youth engagement in HPV immunization. The adolescent HPV immunization program is an excellent opportunity to engage youth. The World Health Organization (WHO) included youth in their call for community participation in health and highlighted that effective adolescent health programs require youth involvement in setting program objectives, policy development and the allocation of resources (WHO, 1993). Despite this, much of what is known about the HPV immunization program is absent of a youth voice. Only two studies were found where youth were involved in the development of an educational intervention, although the depth of the involvement was not discussed (Brabin et al., 2010; Painter et al., 2010). No studies were found that utilized youth engagement or youth-led activities to improve HPV immunization uptake; however, in a school-based Hepatitis B immunization program, student participation was associated with higher uptake of the vaccine (Tung & Middleman, 2005).

With the expanded recommendation from NACI (2012) for both males and females to receive the HPV vaccination, it will be important to consider if males were included in the engagement strategies to improve uptake of the vaccine. This study will provide some initial information from which to develop future studies and may provide a direction for future gender analysis of HPV vaccination programs specifically with respect to male and female uptake.

A promising model for immunization. PHNs working with schools are in a privileged position within the community to help improve uptake of childhood and

adolescent immunization, including the HPV vaccine. The recommendation of the HPV vaccine by a nurse or other health care professionals has been highlighted in the literature as a strong predictor of vaccine acceptability (Brewer & Fazekas, 2007; Ogilvie et al., 2007) and subsequent uptake (Kessels et al., 2012). Despite the fact that PHNs work closely with youth to improve their health, little is known about how PHNs foster community participation and collaboration with key stakeholders, including schools (Cohen, 2006; Rodgers & Gallagher, 2000).

In the Capital Health for instance, PHNs have been working with youth in schools within a Memorandum of Understanding (MOU) which established Youth Health Centres (YHCs) in each of the high-schools within the Halifax Regional School Board (HRSB), providing outreach services to the feeder Junior High schools since 2003 (C. Tawse, Manager, Protecting Health, Capital Health, personal communication, May 22, 2012). Youth-led committees in each high-school are included as a part of this formal agreement, and youth engagement has been a major focus of the work (Capital District Health Authority [CDHA] & HRSB, 2005; C. Tawse, personal communication, Manager, Protecting Health, Capital Health, May 22, 2012). As such, there has been youth engagement activities occurring to promote adolescent immunization since the inception of the program (C. Tawse, Manager, Protecting Health, Capital Health, personal communication, May 22, 2012); however the effectiveness of these strategies has not been evaluated. As Capital Health successfully met the national target for HPV vaccine uptake in the first year of the program, and having an 81% completion rate (D. Mombourquette, Immunization Coordinator, Nova Scotia Department of Health and Wellness, personal communication, May 11, 2012), it is important to explore if youth-led

activities were integral to the success of the program.

Conceptual Framework

Vaccine acceptability and adherence, specifically within the adolescent context is influenced by many factors, and the relationship between personal, social and structural factors is quite complex. In an effort to understand the impact of nursing in the HPV immunization program, a theoretical framework is required that considers the complex interaction of factors and the impact on the behaviour (vaccination). Edwards, Mill and Kothari (2004) have challenged PHNs to move beyond one theory of practice, to integrate relevant theories and consider the interconnections among conceptual elements in targeting complex relationships.

The Health Belief Model (HBM) is the dominant and most consistently used theory in immunization acceptability and adherence studies relating to the HPV vaccine program (Brewer & Fazekas, 2007; Dempsey et al., 2006; Olshen, Woods, Austin, Luskin, & Bauchner, 2005); however there are some limitations to the model. Katz, Ware, Gray, Haberer, Mellins, and Bansberg (2010) propose a conceptual model, 'The Vaccine Perceptions, Acceptability and Adherence Model', which incorporates the HBM model constructs but also considers the limitations of a behaviourist model, which neglects the complexity of the contextual influences, in particular the relationships among individuals and the sociocultural, economic and political factors. The model has had limited use, and the authors stress that further formative research and testing is necessary to refine the model (Katz, Ware, Gray, Haberer, Mellins, & Bansberg, 2010), however, the model highlights the interplay of structural factors impacting vaccine uptake, which has not been identified in other models. This study will build on what is known about the

factors identified through the use of the HBM, and through 'The Vaccine Perceptions, Acceptability and Adherence Model'. The proposed study will also draw on socioecological perspectives of health, and using a youth engagement lens, will also explore what is effective in improving uptake of the HPV vaccine in adolescent immunization strategies.

The Health Belief Model (HBM). The HBM was developed in the 1950s by a group of social psychologists at the US Public Health Service to provide a framework to understand health behaviour and health decision-making (Janz & Becker, 1984). The HBM, which derived from psychological and behavioural theory aims to uncover the value placed on health-seeking behaviours, in particular where a risk-benefit analysis is part of the decision-making process (Janz & Becker, 1984). Four constructs were initially outlined in the HBM to provide an understanding of health behaviour: perceived susceptibility, perceived severity, perceived benefits and perceived barriers (Janz & Becker, 1984). Self-efficacy was added in the revised model due to the learning from social cognitive theory and the important impact of the construct on behaviour (Rosenstock, Strecher, & Becker, 1988). It will be critical in helping to understand strategies effective in increasing motivations and removing barriers in the adolescent HPV vaccine programs, if improvements in uptake are to be achieved.

Perceived susceptibility. Perceived susceptibility relates to the risk perception of acquiring HPV infection and cervical cancer. In a meta-analysis of the relationship between risk perception and health behaviour with immunization as the example, those who perceived themselves to be more susceptible to a vaccine preventable disease were more likely to be vaccinated (Brewer et al., 2007). A number of acceptability studies

have highlighted that risk of HPV infection and cervical cancer may be underestimated by some due to the sexually transmitted nature of HPV and the perception of sexual inactivity or risk in only those who are sexually promiscuous (Dempsey et al., 2006; Vallely et al., 2008). Rosenthal et al. (2008) found that a history of sexually transmitted infections (STIs) or experience and knowledge of HPV infection and cervical cancer by mothers contributed to the decision to have daughters vaccinated.

Perceived severity. Perceived severity of effects of HPV infection and cervical cancer may be related to an understanding of the epidemiology of HPV and cervical cancer. However, there has been mixed results regarding the role of knowledge of HPV infection and its association with HPV vaccine uptake (Caskey et al., 2009; Davis et al., 2004; Cooper Robbins et al., 2010). Brewer et al. (2007) in a meta-analysis of 32 studies, found that those who perceived the severity of illness to be higher were more likely to be vaccinated. In a Canadian study, Ogilvie et al. (2010) found that concerns regarding daughters' health were related to higher uptake of the HPV vaccine.

Perceived benefits. The efficacy of the vaccine in preventing HPV infection and cervical cancer is critical to acceptability of the vaccine. In a systematic review, Brewer and Fazekas (2007) found that parental acceptability was significantly higher for those who believed the vaccine was effective.

Perceived barriers. Most of the research on parental acceptability of the HPV vaccine points to concerns about vaccine safety as a major barrier to HPV vaccination (Kessels et al., 2011; Brewer & Fazekas, 2007). MacDonald, Smith and Appleton (2011) reviewed the impact of heuristics on risk perception and emphasized the need to address

anti-vaccine arguments and vaccine safety concerns, which if not addressed will significantly challenge the public confidence in vaccine programs.

Self-efficacy. The role of self-efficacy in making the decision to be immunized is an important one to be considered in an adolescent immunization program. Adolescent barriers to HPV vaccination have been highlighted in the literature and include vaccine safety concerns (Caskey et al., 2009; Di Giuseppe et al., 2008), as well as injection pain and fear of needles (Brabin et al., 2009; Hilton & Smith, 2010).

The Vaccine Perceptions, Acceptability and Adherence Model. The HBM provides limited insight into contextual and systemic factors and other determinants of health that are impacting the decision to be vaccinated with the HPV vaccine. Our current understanding of the social determinants of health and an emergence of an ecological perspective on health promotion reflects a systems view of health, and highlights broad contextual factors contributing to health (Cohen, 2006; Falk-Rafael, 2005; Raphael, Curry-Stevens, & Bryant, 2008; Young & Wharf Higgins, 2008). Katz et al. (2010) highlight that understanding vaccine acceptability and adherence goes beyond the understanding of individual factors, but must also include an understanding of socioeconomic, political, and structural barriers, as well as an understanding of the challenges targeting an adolescent population (See Figure 2).

Figure 2 The Vaccine Perceptions, Acceptability and Adherence Model

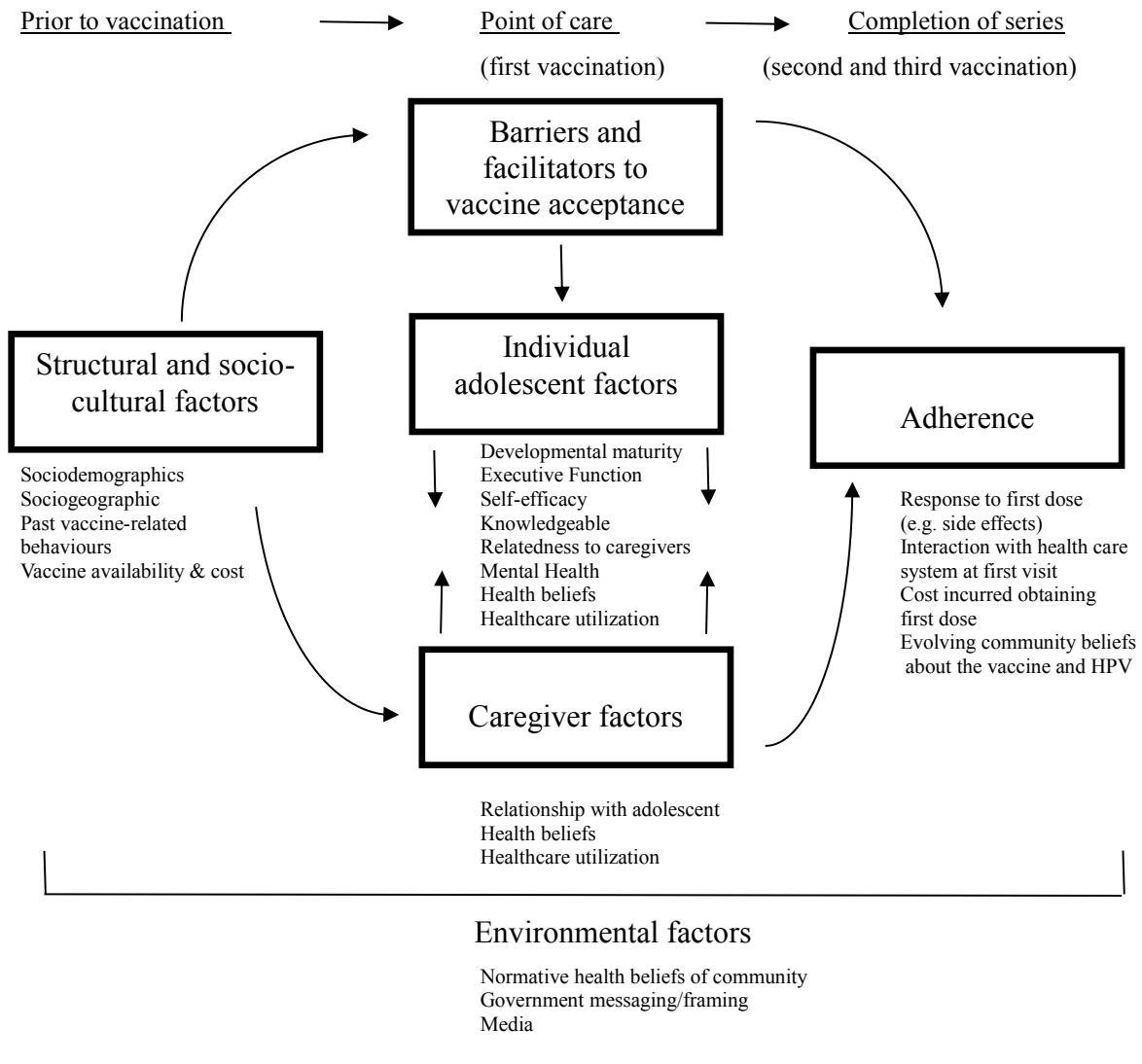


Figure 2. Structural factors, which include school level factors in a school-based immunization program, impact vaccine acceptability and adherence through the interplay of individual youth and parent/caregiver factors. Barriers and facilitators impact perceptions and ultimately adherence to the three-dose HPV series. Environmental factors including message framing are also at play with structural and other factors. Adapted from “The Vaccine Perceptions, Acceptability and Adherence Model, “ by I.T. Katz, N.C. Ware, J.E. Haberer, C.A. Mellins, and D.R. Bangsberg, 2010, Sex Health, 7, p.286, <http://www.publish.csiro.au/nid/164/paper/SH09130.htm>. Copyright CSIRO 2010. Reproduced with permission.

Katz et al. (2010) highlight in the model that structural and sociocultural factors influence both the individual adolescent and his/her caregiver in the decision to receive the HPV. They propose that risk perception in particular is influenced by structural factors, such as sociodemographics, sociogeographics, past vaccine-related behaviours, vaccine availability and cost (Katz et al., 2010). As school-based immunization programs have been found to reduce sociocultural disparities (European Cervical Cancer Association, 2009; Federico et al., 2010; Gottvall et al., 2011), this study will build on the model construct and will examine the effect of school-level factors, namely the engagement of schools, parents and adolescents by PHNs on uptake of the HPV vaccine.

The ongoing exchange of adolescent and caregiver factors outlined in the model are described as part of the process of vaccine initiation and adherence. Adolescent and caregivers perception of benefit and risk are considered with the barriers and facilitators to HPV vaccination and will ultimately impact vaccine uptake (Katz et al., 2010).

External environmental influences are also included in the model constructs and include message framing in the media and by government and community officials (Katz et al., 2010).

Using a Youth Engagement Lens. While improving the health status of the youth themselves, youth-led health projects simultaneously benefit the community and the programs in which youth are engaged (Scheve, Perkins & Mincemoyer, 2008; Suleiman et al., 2006). Existing research suggests that by actively involving the target audience (youth) in the development of the health intervention, the empowering process results in more effective programs and better adherence to these programs (RNAO, 2009; Scheve et al., 2008; Suleiman et al., 2006). 'The Vaccine Perceptions, Acceptability and Adherence

Model' could be strengthened in targeting HPV vaccination adherence within a youth engagement lens, if the engagement of youth is shown to be effective in improving initiation or completion of the HPV vaccine.

Delgado and Staples (2008) define community organizing that is 'youth-led,' as a process which emphasizes "the power of young people to define their circumstances and the direction of intervention" (p. 17), as opposed to token leadership. Involving youth in shaping services and programs to address health increases their sense of power, control and sense of responsibility for their own health (Suleiman, 2006).

Strategies to support youth participation and opportunities for influencing health programs include: incorporate a youth voice into committee structures, form youth advisory committees or ad hoc committees for programs and services development and evaluation, offer peer support as a component of programs, integrate peer educators into program delivery, and engage youth as researchers through participatory action research methods (Periera, 2007; RNAO, 2009).

A review of the literature in chapter two will consider the model constructs drawing on evidence of HPV vaccine acceptability and adherence, as well as strategies and interventions to improve adherence to adolescent immunization.

Chapter 2 Literature Review

A literature review was conducted to examine literature around the factors that are predictive of HPV vaccine uptake and, the effectiveness of various interventions to help improve uptake of the HPV vaccine in school-based immunization programs. A variety of searches were utilized including: databases (CINAHL, Medline/Pub Med, and the Cochrane Library), citations in bibliographies, known resource websites, and networking with clinicians in the field of public health, immunization practice and vaccinology. The initial review used broad search terms such as “human papillomavirus (HPV) vaccine”, “adolescents”, “interventions”, “strategies”, and “nursing”. As well, a search for existing policy papers and national immunization program recommendations related to HPV immunization and grey literature was also completed. The literature that was included in the review was all related to school based immunization programs, and published between 1995 to April 2012. This literature spanned the years from the time Hepatitis B school-based immunization programs were introduced in Canada (i.e., 1995). Qualitative and quantitative studies and systematic reviews related to HPV immunization programs that were published between 2005 to April 2012 were also used, covering the years that HPV vaccine was developed and available for use in school-based immunization programs.

Human Papillomavirus (HPV) Vaccine Acceptability and Adherence

Factors and predictors of HPV vaccine uptake have been well cited in the literature (Brabin et al., 2008; Brewer & Fazekas, 2007; Kessels et al., 2012; Zimet, Liddon, Rosenthal, Lazcano-Ponce, & Allen, 2006). These include studies that have examined: 1. parental/caregiver factors (Cooper Robbins et al., 2010; Dempsey et al.,

2006; Hughes et al., 2009; Kahn et al., 2008; Ogilvie et al., 2007; Ogilvie et al., 2010; Olshen et al., 2005; Reynolds & O'Connell, 2011; Rosenthal et al., 2008); 2. adolescent factors (Agius et al., 2010; Caskey et al., 2009; Brabin et al., 2009; Di Giuseppe et al., 2008; Forster, Marlow, & Waller, 2009; Mathur, Mathur, & Reichling, 2010; Reiter, Brewer, Gottlieb, McRee & Smith, 2009); and 3. health professional factors (Brabin et al., 2007; Duval et al., 2009; Ford, English, Davenport, & Stinnett, 2009; McRee, Reiter, & Brewer, 2010; Stretch et al., 2009; Wood, Morris, Davies, & Elwyn, 2011).

Parental factors. Identifying predictors of parental intention to vaccinate their daughters has been the focus of much of the research around HPV vaccine delivery. Despite questions raised about HPV vaccination (Lippman, Melychuk, Shimmin, & Bosco, 2007; Tomljenovic & Shaw, 2011) and the negative tone it has caused in the media (Abdelmutti & Hoffman-Goetz, 2009), a number of systematic reviews and empirical studies have found that most parents are highly favourable of vaccinating their daughters with the HPV vaccine (Brewer & Fazekas, 2007; Dempsey et al., 2006; Kessels et al., 2012; Ogilvie et al., 2007; Zimet et al., 2006).

Acceptability of parents to have their daughters receive the vaccine was highest for those that believed that the vaccine was effective (Brewer & Fazekas, 2007; Ogilvie et al., 2010; Zimet et al., 2006), who perceived their daughters to be at risk of serious infection (Brewer & Fazekas, 2007; Cooper Robbins et al., 2010; Dempsey et al., 2006; Kahn et al., 2008; Ogilvie et al., 2010; Olshen et al., 2005; Reynolds & O'Connell, 2011; Rosenthal et al., 2008; Zimet et al., 2006), and had strong personal health beliefs (i.e., belief in health prevention and benefits of vaccines) (Cooper Robbins et al., 2010; Dempsey et al., 2006; Kahn et al., 2008; Ogilvie et al., 2010; Reynolds & O'Connell,

2011; Rosenthal et al., 2008). Studies also show that parents value the recommendation of a physician (Brewer & Fazekas, 2007; Dempsey et al., 2006; Ogilvie et al., 2007; Ogilvie et al., 2010; Olshen et al., 2005; Kessels et al., 2012; Zimet et al., 2006) and, communication with a nurse or other health care providers around the benefits of the vaccine (Kessels et al., 2012; Ogilvie et al., 2007; Reynolds & O'Connell, 2011). Personal experience with a sexually transmitted infection (STI) and /or HPV infection was also associated with higher acceptability of the vaccine (Dempsey et al., 2006; Rosenthal et al., 2008).

Knowledge of HPV infection, cervical cancer and the HPV vaccine itself, was not always predictive of higher acceptability of the vaccine among the parents (Davis et al., 2004; Dempsey et al., 2006; Hughes et al., 2009; Kahn et al., 2008; Kessels et al., 2012; Ogilvie et al., 2007), despite that many studies found that parents overall, had low levels of HPV vaccine knowledge (Brewer & Fazekas, 2007; Hughes et al., 2009; Olshen et al., 2005; Reynolds & O'Connell, 2011). The educational level of the parents was also found to be a significant finding in a number of other studies (Hughes et al., 2009; Ogilvie et al., 2010; Rosenthal et al., 2008). Parents with lower levels of education reported higher vaccine acceptability in a number of studies, including one Canadian study (Brewer et al., 2007; Davis et al., 2004; Ogilvie et al., 2010; Zimet et al., 2006). Interestingly, a Nova Scotia study by Dummer, Parker, and Cui (2010) found that the completion of childhood immunizations was significantly higher in more educated individuals, as defined by having received a high school diploma; however, the trend was reversed for university educated, where vaccine completion was significantly lower for babies of parents with a university degree. Having cost eliminated as a barrier (i.e. funded program or health

insurance) was also positively associated with increased uptake of the HPV vaccine (Kessels et al., 2012).

HPV vaccine safety concerns (Dempsey et al., 2006; Ogilvie et al., 2007; Ogilvie et al., 2010), pain associated with vaccination (Dempsey et al., 2006; Reynolds & O'Connell, 2011), and parents who did not see their child at risk of acquiring HPV were often cited as barriers to vaccine uptake (Black et al., 2009, Cooper Robbins et al., 2010; Zimet et al., 2006). Some studies found that parents were concerned receiving the HPV vaccine would increase adolescent sexual activity (Cooper Robbins et al., 2010; Ogilvie et al., 2007; Reynolds & O'Connell, 2011).

A study by Hughes et al. (2009) examined whether HPV and HPV vaccine awareness, knowledge, and use of information sources differed across sociodemographic characteristics. Similar to cervical cancer disease burden, the authors found that an awareness and knowledge of HPV and the HPV vaccine differed by race, family income, highest education obtained, and other sociodemographic characteristics (Hughes et al., 2009). The information sources found to be predictive of HPV uptake included the availability of print media (from a brochure, but not from newspapers), health care providers, or family and friends (Hughes et al., 2009). Vaccine uptake was also higher for the daughters of caregivers who had heard mostly positive media coverage (Hughes et al., 2009).

Adolescent factors. A number of studies captured the adolescent experience with the introduction of the HPV vaccine (Agius et al., 2010; Brabin et al., 2009; Caskey et al., 2009; Di Giuseppe et al., 2008; Forster et al., 2009; Mathur et al., 2008; Reiter et al., 2009) highlighting both the similarities and differences from parental attitudes and

beliefs about the vaccine. Several of these studies looked at adolescent knowledge and acceptance of the HPV vaccination as predictors of intent (Agius et al., 2010; Caskey et al., 2009; Di Giuseppe et al., 2009; Hilton & Smith, 2011), and their role in the decision-making process (Brabin et al., 2009; Forster et al., 2009; Mathur et al., 2008). A number of other studies highlighted that pain and fear of needles are significant barriers for adolescent girls in receiving the HPV vaccine (Hilton, & Smith, 2011; Kessels et al., 2012; Reiter et al., 2009).

Knowledge, acceptability and intent. Adolescent knowledge of HPV infection, cervical cancer and the HPV vaccine does not necessarily translate into acceptability and intent to be vaccinated (Brabin et al., 2010; Hilton, & Smith, 2011; Mathur et al., 2010). One qualitative study used focus group to explore adolescent girls' (i.e., 12-18 years of age) understanding of HPV and its link with cervical cancer, and their experiences with vaccination in the year following the introduction of the program in Scotland and England (Hilton & Smith, 2011). The results showed that even though 90% of the girls reported receiving the vaccine, many knew very little about HPV infection and transmission. Only two of the girls knew that HPV was highly prevalent, and most believed that HPV infection was only common among people who had multiple sexual partners. Some of the girls reported reading information leaflets, but many reported that their mothers had been most instrumental in making the decision (Hilton & Smith, 2011). Brabin et al. (2010) surveyed girls six months following the vaccination offer and found that the majority of girls could not spontaneously recall key messages about HPV infection, cervical cancer and the HPV vaccine. Di Giuseppe et al. (2008) explored the knowledge, attitudes and behavioural intention toward HPV vaccination among

adolescent and young women in Italy and found that knowledge levels were 'remarkably poor', even though most (81.7%) intended to receive the HPV vaccine. In a pilot survey of 170 California female students, 37.8% of the students reported receiving the vaccine, 45.5% had not and 16.7% were unsure if they had received the vaccine. The authors found that students who had received the vaccine had significantly higher vaccine-related knowledge scores compared to the unvaccinated group (Mathur et al., 2010). In a study of a school-based program in Australia, where 86% of the female respondents and 4.4% of the male respondents were immunized, knowledge levels of adolescents regarding HPV and cervical cancer were higher in students who reported being immunized (Agius et al., 2010). The authors found that the process of being immunized against HPV may lead to increased awareness and knowledge (Agius et al., 2010). The low level of knowledge of girls found in most studies may be attributed to providing information mainly to parents, who may or may not engage their daughters in the discussion about the vaccine.

Risk perception was found to be an important factor in adolescent uptake of the HPV vaccine (Brabin et al., 2010; Mathur et al., 2010; Di Giuseppe et al., 2008). In one study, risk was reported as overestimated in both the vaccinated and unvaccinated groups, although the estimation of risk was through an open-ended question format (Mathur et al., 2010). Di Giuseppe et al. (2008) found that most girls in the study did not see themselves at risk for infection or disease, which was attributed to their limited knowledge of prevalence by the authors. However, girls in the study that did perceive a risk were more likely to report that they would pursue vaccination (Di Giuseppe et al.,

2008). Similarly, Brabin et al. (2010) found that fear of cervical cancer was expressed by girls with intentions to vaccinate.

Similar to the parents, having the HPV vaccine endorsed by a doctor, nurse, or other health care providers was associated with higher adolescent uptake of the HPV vaccine (Brabin et al., 2009; Caskey et al., 2009; Mathur et al., 2010). Discussing the vaccine with family was also shown in some studies to increase the likelihood of vaccine receipt (Caskey et al., 2009; Brabin et al., 2009; Forster et al., 2009; Mathur et al., 2010; Zimet et al., 2006).

Most studies found that for those girls who reported their intention of not receiving the vaccine, safety was the main barrier (Brabin et al., 2009; Caskey et al., 2009; Di Giuseppe et al., 2008; Hilton & Smith, 2011). In a nationally represented sample of adolescents in the US, Caskey, Tessler Lindau, and Alexander (2009) found that barriers to vaccine uptake included a lack of knowledge regarding HPV, reports of not being sexually active, and cost of the vaccine (Caskey et al., 2009). In studies that have followed the implementation of the program, adolescents reported perceiving the vaccine to be painful and expressed anxieties and fears of needles; both impacted vaccine uptake (Brabin et al., 2009; Hilton & Smith, 2011; Reiter et al., 2009).

Involvement in decision-making. No Canadian studies were found that discussed the involvement of adolescents in decision making in the HPV immunization program, despite the fact that adolescents may consent to the HPV vaccination in a number of jurisdictions, including Nova Scotia (Peppin, 2007). Legislation governing informed consent for medical treatment has not been enacted in all jurisdictions, including Nova Scotia (only in British Columbia, Ontario, Prince Edward Island and the Yukon), and

therefore, adolescents may consent to the HPV vaccination in the absence of a clearly defined age of consent policy (Peppin, 2007). This is similar to case law in the United Kingdom, in which the consent process is based on the “Gillick Principle”, which allows for children under the age of 16 to provide consent for medical treatment if they are able to understand the information about the proposed treatment (Allen, 2006; Crosbie, 2007). Brabin et al., (2009) in a follow-up from the Manchester study. found that 77% of girls shared in the decision-making with their parents. Of the girls whose parents had refused the vaccination, 42% stated that they wanted the vaccine, while 10% of those who were vaccinated did not want the vaccine. They found that mothers who talk to their daughters are more supportive of vaccination, and suggested that it helps girls prioritize vaccination and think about future health and relationships.

In a pilot study designed to identify factors associated with HPV vaccination uptake and decision making in California, Mathur, Mathur, and Reichling (2010) found that 37.8 % of the students in the survey reported receiving the vaccine, 45.5% had not, and 16.7% were unsure if they were immunized. Of those that were not vaccinated, 9.2% reported participating in the decision with their parents or guardians, and of those that were vaccinated, 39.2% reported they had participated in the decision with their parents or guardians; a total of 48% participated in the decision-making process. The authors of this study found that the vaccination rate and rate of participation in vaccine decision-making was similar in private and public schools.

In another UK study, Forster et al. (2009) found that adolescents, 14 to 15 years of age, expressed strong intentions to receive the vaccine in a HPV 'catch-up' program and 72% of the girls believed their parents would let them have the vaccine. The adolescents

felt reassured when their parents gave consent and most did not believe that vaccination consent implied approval for them to be sexually active.

Brabin, Roberts and Kitchener (2007) investigated parents' views on making HPV vaccine available to adolescents without parental consent and found that most parents felt that children who were well informed should be able to give consent to vaccination.

Socio-demographic factors. In a systematic review looking at uptake of the HPV vaccine, Kessels et al. (2012) found that race, ethnicity, and age were factors that influenced, both positively and negatively, the uptake of the HPV vaccine. Similarly, Brabin et al. (2008) found that uptake was significantly lower in schools with a higher proportion of ethnic minorities, and in schools where girls were entitled to free school meals. In the review, Black and Asian girls were less likely to initiate the vaccination program compared to Caucasian and conflicting findings were found regarding Hispanic girls (Kessels et al., 2012). In most studies in the review, higher vaccination rates were reported among girls between 13 and 15 years of age; rates decreased in girls between 15 and 17 years of age (Kessels et al., 2012). These findings highlight the importance of reaching adolescents in school and support the current Nova Scotia target at grade seven.

Health professional factors. Given that for parents to assent to vaccination and engage in discussions with their daughters, a key factor influencing parental and adolescent acceptance of the HPV vaccine is advice and recommendation of a health professional (Kessels et al., 2011), it is important that PHNs are knowledgeable about HPV infection, cervical cancer, and the HPV vaccine as well as cognizant of their own personal views and biases regarding the vaccine. Only one Canadian study of nurses' knowledge, attitudes and intentions around vaccinations was found in the literature.

Duval et al. (2009) surveyed nurses in 2007, prior to the launch of the publicly funded HPV immunization program. They found that almost all of the nurses surveyed (97%) perceived routine immunizations useful; almost all (93%) would support HPV if it was publicly-funded, and most (85%) would recommend HPV vaccination to their patients. The study highlighted that knowledge, perceived self-efficacy, societal views and colleague support were also associated with vaccine endorsement.

A UK study that explored school nurses' views on vaccinating 12 to 13 year old girls with HPV without parental consent in a school-based program found that rather than vaccinate without parental consent, school nurses would defer vaccination (Stretch et al., 2009). Nurses made this decision even though girls included in this study were legally permitted to consent for the vaccine themselves (Stretch et al., 2009). The results of this study suggest that nurses require a deep understanding of legislative requirements for informed consent and programs must have clearly defined consent processes in place to support the nurses when consent issues arise. In another UK study of the first year of implementation of the HPV immunization program, Hilton et al. (2011) found that nurses were generally well informed and willing to recommend HPV vaccination to parents and adolescents; the authors credited the high uptake of vaccines to the health professionals implementing the program.

School-based immunization program delivery factors. There is limited research in the literature that examines the role program delivery factors play on the uptake of the HPV vaccine in school-based immunization programs (Brabin et al., 2007; Brabin et al., 2008; Brabin et al., 2011; Cooper Robbins et al., 2010; Hilton et al., 2011; Stretch et al., 2009; Watson et al., 2009; Wilson et al., 2012). Insights learned from other

successful school-based immunization programs, for example, influenza and Hepatitis B, highlight the importance of program delivery factors in influencing uptake of the vaccines (Cawley, Hull, & Rousculp, 2010; Tung & Middleman, 2005).

Schools as gate-keepers to HPV immunization programs. Wilson et al. (2012) evaluated Ontario's publicly-funded school-based immunization program, and found that school board engagement was critical to the success of the program, although there were many issues highlighted, including difficulties in receiving agreement from the local school boards to conduct the program. For example, two English-language, Catholic school-boards refused to allow the program to be offered in their schools and two others required alternate communication products to be distributed to the students. In the same year of the study, Ontario had a lower than expected uptake of the HPV vaccine (series completion) with a reported rate of 51% (CDC, 2011).

In another study, Watson et al. (2009) also found that schools could act as gatekeepers of immunization programs. For example, two Christian schools in the roll-out program in South Australia refused to allow immunization providers to include HPV in their vaccination program due to concerns of promoting early sexual promiscuity. The eligible girls were advised to attend a clinic held outside of the school resulting in lower than expected uptake. Similarly, Brabin et al. (2008) reported that two schools in Manchester, UK refused to participate in a HPV vaccination program for religious reasons.

Model of program delivery. Only one study was found that evaluated the nursing model of program delivery in a school-based program. This UK study compared one primary care trust that used a dedicated immunization team of nurses who linked the

school nurse with other primary care trusts that had nurses working in small teams. Using a dedicated immunization team yielded a higher vaccine uptake and was shown to reduce the burden of negotiating with individual schools, but still capitalize on the cooperation of the local school nurse and the quality of her relationship with her school (Brabin et al., 2011).

School nurse – school relationship. In a UK study by Brabin et al. (2011), looking at the role of the school nurse and school factors in the uptake of the HPV vaccine, the authors stress the importance for a successful HPV program through the relationship between the school and school nurse. This relationship is often affected by the schools' expectations, workload, organizational support, as well as personal ability of the nurse. In their study, vaccine uptake was higher when the initiative was seen as a joint responsibility between the school nurse and the school, and teachers played a key role in promotion of the vaccine (Brabin et al., 2011). Cooper Robbins et al. (2010) found that teachers played an important role in mediating fear related to vaccination in the HPV program. Similarly, studies that examined the effect of school-level factors in a school-based hepatitis B immunization program found that consent return rate was higher when teachers were involved in promotion of the program and with educational package distribution (Luthy et al., 2010; Tung & Middleman, 2005).

Nurses have to negotiate access to schools and in so doing often will need to justify activities, including immunization programs, to school administrators (Brabin et al., 2011). In a systematic review of school-based immunization programs, Cawley et al. (2010) found that effective school-based programs were those in which the school nurse was able to win and maintain the support of school principals, and maintain frequent

communication with schools and parents. However, Brabin et al. (2011) found that in some instances, the school nurses were not necessarily trained to take on the required leadership roles, and few nurses reported feeling comfortable with the mechanisms for problem resolution. In successful school-based Hepatitis B immunization programs, nurses encouraged school engagement or facilitated 'buy in' to the program (Daley et al., 2009; Guarjardo et al., 2002; Tung & Middleman, 2005). Differences in uptake may be attributed to a number of factors including: characteristics of the school, schools' attitude toward health interventions and how they view their role within a school-based immunization program, organizational problems, multiple school nurse roles and/or personal ability (Brabin et al., 2011, Hilton et al., 2011, Cooper Robbins et al., 2010).

In summary, school nurses struggle to balance their competing clinical demands and limited resources, often feeling torn about working with youth, in particular, around immunization (Brabin et al., 2011; Hilton et al., 2011).

School-Based Immunization Interventions and Strategies

Few studies have been done to provide robust evidence regarding the best way to target these or other system level factors that may contribute to the decision to receive or not receive the HPV vaccine (i.e., other than cost related). School-based interventions have not been well studied. Despite several descriptive reports (Grace, 2006; Hernandez & Nestor, 2006; Higham & Craig, 2008; Thomson et al., 2009), only a few have evaluated the acceptability of interventions, such as written information, educational brochures and video promotion (Brabin et al., 2010; Davis et al., 2004; Dempsey et al., 2006, Mak et al., 2011, Wilson et al., 2012) as strategies to improve uptake. While there have been a number of studies that have used uptake of the vaccine as an outcome

measure (Agius et al., 2010; Brabin et al., 2008; Kessels et al., 2012; Ogilvie et al., 2010), none of these studies actually analyzed these interventions or strategies as a means of improving vaccine uptake with the completion of the three dose series. Nursing strategies were only examined in a few studies (Hilton et al., 2011, Mak et al., 2011).

In a Canadian study that examined factors that impacted uptake of the first dose of HPV vaccine in a school-based program in British Columbia, a comprehensive vaccine education program was described but not evaluated (Ogilvie, et al., 2010). Sixty-five percent of parents reported that their daughters had received the first dose of the vaccine, and the educational program targeted issues such as vaccine safety and efficacy through a provincial website, DVDs targeting parents and girls, as well as pamphlets, brochures and locally held information sessions for parents and providers (Ogilvie et al., 2010).

In a Manchester study, the uptake of the first two doses of HPV vaccine by adolescent girls was reported by parents to be 70.6% for the first dose and 68.5% for the second (Brabin et al., 2008). Interventions used to help promote the vaccine included a flyer summarizing the content of an educational film for girls and details for parents' information evenings (Brabin et al., 2008). Another strategy was to reschedule visits for missed appointments (Brabin et al., 2008). The use of the film was tested for acceptability in a follow-up study (Brabin et al., 2010), but not for the effect on vaccine uptake.

Agius et al. (2010) examined a nationally representative sample in Australia, where 86% of the female respondents and 4.4% of males were immunized. They found that the process of being immunized against HPV may lead to an increased awareness and knowledge and attributed this to the information material that was given to students prior to vaccination. Specific tools or processes were not evaluated.

In their systematic review, Kessels et al. (2012) aimed at identifying factors associated with initiation and/or completion of the three-dose series in adolescent girls within 25 studies. The study setting for most studies was primary care and local health clinics, with three studies of school-based programs cited in the review. The uptake of the vaccine ranged from 9% to 86%, with the highest uptake cited in studies of school-based programs. Individual adolescent and parental factors were highlighted, however, interventions or school-level factors were not part of the review.

Interventions to engage schools. Despite the fact that a number of school-level factors have been highlighted to impact uptake of the HPV vaccine (Watson et al., 2009; Wilson et al., 2012), no studies were found examining interventions to engage schools in the delivery of the HPV immunization program. Cawley et al. (2010), in a systematic review of successful school-based immunization programs (Hepatitis B and influenza), found that strategies to get buy-in from teachers improves the consent return rate. Strategies that were highlighted in the review included reducing paperwork of teachers, providing a stipend for after-school workshops, providing incentives for teachers and expressing appreciation in writing (Cawley et al., 2010). Tung et al. (2005) found that repeated visits with teachers were not significant in improving uptake. The collection and sharing of aggregate data regarding vaccine coverage and adverse events with schools to establish the impact of the program was highlighted as a best practice found in the literature (Cawley et al., 2010).

Interventions to engage parents. Intervention studies to increase parental acceptance of HPV vaccines using written information have yielded mixed results (Davis et al., 2004; Dempsey et al., 2006; Stretch et al., 2008). Some successful strategies have

included: resending consent package information home with students, hosting parent information sessions, educational interventions and peer-level interventions (Mak et al., 2011; Stretch et al., 2008; Wilson et al., 2012).

Written information. Dempsey et al. (2006) published the only randomized intervention study looking at parental acceptance of HPV vaccines through the use of written information about HPV. They found that although those that received the information sheet had higher scores on knowledge scales, there was no significant difference in the parental acceptability of the vaccine. Similarly, Stretch et al.'s. (2008) survey of parents whose daughters were offered HPV vaccination in the UK found that fact sheets were not effective in improving uptake. Alternatively, Davis et al. (2004) found that written information about HPV did improve parental acceptability of HPV vaccines.

Reminders and recall. In a study of strategies to improve the return rate of consents within a HPV school-based immunization program in Western Australia, Mak et al. (2011) found that only one strategy had a significant effect on return rate: resending an information and consent package home with the student. Nurses in the school based immunization program in the UK also described using reminders such as phone calls and resending consent packages to parents in schools especially those located in deprived areas (Hilton et al., 2011). Another study highlights that reminders and recall strategies may be necessary when there are communication issues, especially when vaccination information about HPV did not reach some parents (Cooper Robbins et al., 2010). Wilson et al. (2012) also highlighted re-sending communication materials to grade 7 female students and their families at the time of the last dose of the hepatitis B vaccine as

effective in improving vaccine acceptance. Cooper Robbins et al. (2010) suggest that communication from the schools via newsletters, emails and announcements on school websites can also facilitate the process. A Canadian study evaluating the Hepatitis B program found that almost one-third of parents of children who did not present at the first school clinic were not aware of the school-based Hepatitis B program, and uptake improved significantly for those who received a follow-up call compared to those who received only a follow-up letter (Stewart et al., 1997).

Access to a nurse. Hilton et al. (2011), in a UK study of the first year of the HPV immunization program, found different nurse-led strategies were effective with parents, depending on their decision-making behaviours. For instance, most parents who were classified by the authors as 'active acceptors', the nurses believed these parents needed reassurance rather than information; for example, phoning to address concerns around needle phobia. Cooper Robbins et al. (2010) also found that the convenience of school delivery and having a school nurse to address questions was important for parents of daughters who received the vaccine. In a Canadian study evaluating immunization programs, the authors found that the successful school-based immunization programs had nurses working directly with parents to discuss immunization issues (Salmon et al., 2005).

Flexible vaccination appointments. Hilton et al. (2011) found that to increase uptake, nurses conducted home visits or offered alternate appointments to reach students in schools in deprived areas. Cawley et al. (2010) also found that flexible arrangements, such as additional appointments outside of scheduled clinics, and return visits to the schools to vaccinate missed students, were key to successful adherence in school-based

immunization programs. They also found in the review that because of high absenteeism, scheduling of immunization clinics on days other than Fridays and Mondays improved coverage (Cawley et al., 2010).

Parent information sessions. Stretch et al.'s (2008) survey of parents whose daughters were offered HPV vaccination in the UK found that parent information evenings were not effective in improving uptake. They found that parent evening sessions were attended by a minority of parents, many of which were against the vaccine (Stretch et al., 2008). Similarly, in the study by Hilton et al. (2010), nurses described low attendance at parent information sessions, and the need to use other strategies to reach parents, especially those who are undecided. Overall, nurses found that those parents who did phone or attend information sessions were those in least need of information, and suggested that parent information sessions would be ineffective in influencing vaccine decision-making (Hilton et al., 2011).

Legislation and school requirements. A large number of studies have shown that uptake of vaccines is also improved when programs are mandated through legislation (Averhoff, 2004; Gullion, Henry, & Gullion, 2008; Humiston et al., 2009; Luthy, Beckstrand, & Callister, 2010; Salmon et al., 2005). However with the HPV immunization, the introduction of legislative requirements spurred public backlash and organizing of special interest groups to oppose the requirements in a number of jurisdictions (Dekker, 2008).

Other strategies. In a school-based Hepatitis B program, other interventions including Public Address (PA) announcements, school assemblies, incentives, educational videos, educational activities, and repeated nurse visits to the teacher were not significant

in improving vaccine uptake (Tung & Middleman, 2005). Use of incentives was found in other studies to promote vaccine consent return rate (Cawley et al., 2010; Guajardo et al., 2002).

Interventions to engage youth. Studies have found that successful school-based immunization programs had student cooperation and student champions (Brabin et al., 2010; Hammer, Abrams, & Mestas, 2009; Guajardo et al., 2002; Kwan, Tam, Lee, Chan, & Ngan, 2011; Tung & Middleman, 2005; Vallely et al., 2008).

Vallely et al. (2008) developed and evaluated a film about a school workshop on HPV that included students, parents, teachers and two doctors. They found that the process of involving students, parents and teachers in the development of the film minimized the risk of offending religious and/or cultural values.

In a follow-up study, Brabin et al. (2010) assessed if the film had influenced the adolescents' vaccine decision to take the vaccine and what vaccine related information they recalled. Two-thirds of the girls who watched the film stated that it helped them decide to receive the vaccine; however, 6 months following vaccination, the majority could not remember any of the key messages from the film. They also found that one third of girls who completed the questionnaire had not watched the film, due to absenteeism, parent refusal, local school nurse team preference for their own educational resources, scheduling difficulties with particular schools or problems with audio equipment. The results highlight the programmatic difficulties of ensuring the provision of standardized vaccine information, even in a school setting.

Kwan et al. (2011) evaluated the effects of a school-based cervical cancer education program on Hong Kong Chinese adolescent girls. The educational program

consisted of a didactic slide presentation followed by interactive question and answer session, lasting about 1 hour in duration. The educational program led to a substantial increase in knowledge, positive attitude towards HPV vaccination and increased perceived support from family and peers in the adolescent participants and a greater intention to be vaccinated with the HPV vaccine. As peer support significantly affected vaccination intention, the engagement of youth as a strategy is an opportunity to improve the uptake of the HPV vaccine in the school setting.

Tung et al. (2005) examined the effect of school-level factors in a school-based hepatitis B immunization program and found that series completion rate was higher in schools in which students were involved in consent package distribution.

Critique of the Evidence

Most of the studies examining factors predictive of acceptability and adherence to the HPV vaccination were surveys, and many were retrospective reviews of data, with most using a cross-sectional design. Non-experimental research studies offer the benefit of exploring these factors as they naturally occur (LoBiondo-Wood, & Haber, 1990), and are well suited for examining issues of population health (Loiselle, Profetto-McGrath, Polit, & Beck, 2007). Surveys can provide a wealth of data and capture an accurate picture of the target population, and cross-sectional and retrospective reviews have provided readily available information on factors (Lobiondo-Wood & Haber, 1990; Loiselle, Profetto-McGrath, Polit & Beck, 2007) to guide the roll-out of the HPV immunization program. One study (Brewer et al., 2011), used a longitudinal design in which the girls were followed up after 12 to 18 months to determine which factors may have influenced decision-making. One systematic review (Kessels et al., 2012) was

found to examine factors that affect uptake of the HPV vaccine.

There were a number of limitations of the studies reviewed, whereby many of the studies were variable in outcome definition and measurement. Some studies examined intent to be vaccinated as an outcome, while others measured the completion of the three-dose HPV vaccine series. Although intention has been found to be significantly positively correlated to HPV vaccine completion in a number of studies (Kessels et al., 2012), the rate of uptake may not be equivalent. Further, the outcome measure was gathered using self-report instead of the use of epidemiological data, which may have introduced response bias. There was little consistency in factors controlled in multivariate analysis, which may limit the validity of findings. Some studies lacked sufficient statistical power given their small sample sizes. Further, most studies were conducted prior to, or shortly thereafter the start of the HPV immunization program, and it is possible that reported factors and uptake may have changed, as new information was learned, and uptake may have improved. Finally, there is limited evidence about the completion of the three-dose series, than about acceptability and initiation of the vaccine series.

The evidence examining interventions and strategies that are effective in increasing uptake of the HPV vaccine in school-based immunization programs was very limited, and included only one published randomized intervention study (Dempsey et al., 2006). The remainder of the studies described interventions and strategies utilized in school-based HPV immunization programs, however the effectiveness was not tested. Evidence of best practice strategies were drawn from the literature that looked at school-based Hepatitis B and influenza immunization programs. One systematic review was included (Cawley et al., 2010), and other studies were surveys using a cross-sectional

design. For public health purposes, randomized controlled trials are expensive and are often inappropriate or unrealistic because of the requirement to manipulate a single or limited set of variables (Cawley et al., 2010; Loiselle, Profetto-McGrath, Polit, & Beck, 2007).

In reviewing the literature, that examined factors predictive of HPV vaccine acceptability and adherence, and the effectiveness of strategies to improve uptake, it is clear that a deeper understanding of which strategies contributed to better school-based HPV immunization programs is required. As such, the proposed study will examine which nurse led strategies were effective in improving HPV vaccine uptake. The following chapter will discuss the study design and methodology.

Chapter 3 Methodology

In reviewing the literature exploring best practice in school-based immunization programs, it was important to examine the structural factors that impacted the uptake of the HPV vaccine in a successful school-based immunization program. Katz et al. (2010) highlighted in the Vaccine Perceptions, Acceptability and Adherence Model that structural and sociocultural factors influence the decision to receive the HPV vaccine. Although Katz et al. (2010) limited the definition of structural factors to include sociodemographics, sociogeographics, past vaccine-related behaviours, and vaccine availability and cost, this study examined other important structural factors, namely program delivery strategies and nursing interventions used by PHNs in schools in the school-based HPV immunization program in Greater Halifax.

The study employed a retrospective, exploratory, correlation study design to examine the relationship between structural factors impacting vaccine adherence and vaccine refusal, initiation, and complete uptake of the HPV vaccine (i.e., the three dose series) in a school-based immunization program in the greater Halifax area. Correlational studies with a retrospective design, attempt to ascertain antecedent factors that may have impacted a presently occurring outcome (Loiselle et al., 2007). In this case, the aim of the analysis was to explain any relationship between nurse directed strategies that engaged schools, parents and youth and adolescents, parents and school personnel in each of the schools and HPV vaccine uptake.

Goals and Objectives

The purpose of this retrospective, exploratory correlation study was to examine the relationship between HPV vaccine refusal (no vaccine), uptake (one to two doses) and

adherence (completion of three doses) of adolescent girls in a school-based HPV vaccination program and PHN-led strategies for the years 2010-2011. More specifically, the objectives were:

1. To explore activities and strategies utilized in PHNs practice in fostering youth, parental and school engagement in the HPV Immunization Program;
2. To examine the effect of youth, parental and school engagement activities on vaccine refusal, initiation, and completion of the three doses of the HPV vaccination series; and
3. To enhance the knowledge of PHNs in identifying strategies to increase vaccine uptake in school based vaccination programs.

HPV vaccine uptake, coverage and adherence are terms used throughout the literature describing, at times, different outcomes. For the purpose of this study, HPV vaccine uptake included three outcome variables: (a) vaccine refusal, having received no doses of the HPV vaccine; (b) vaccine initiation, having received one to two doses of the HPV vaccine; and (c) adherence, completion of the three dose series of HPV within the school-year, 2010-2011. HPV vaccine coverage data from all eligible females in the 2010-2011 school year will be used in a secondary analysis to determine impact of PHN strategies on vaccine refusal, vaccine initiation and completion of the HPV vaccination series.

Setting

Capital Health is the largest health district within Nova Scotia, serving approximately 400,000 people. It includes the provincial capital, the Halifax Regional Municipality (HRM), and the western part of Hants County, serving both urban and rural areas.

This study targeted strategies used by nurses working in the Capital Health district school-based immunization program. PHNs provide services to 195 schools located in Capital Health, of which, 18 are high-school (14 with grades 10-12, two with grades 9-12, two with grades 7-12); 40 junior high (39 with grades 7-9; one with grade 7-8); 112 elementary (grades primary to 6); and 25 private schools (which range in grade and size). Most of the schools (n=161) fall within the Halifax Regional School Board (HRSB); six of the schools (two each of elementary, junior-high, and high-school) are part of the French school board, Conseil Scolaire Acadien Provincial (CSAP); and three schools (one high school and two junior high schools) are part of the Annapolis Valley School Board (AVSB). For the purpose of this study, public health data from 69 schools will be included in the analysis, 51 schools are from the HRSB, 2 CSAP schools, 2 AVSB schools and 14 private schools.

In the 2010-2011 school-year, a cervical cancer health promotion campaign was launched for one year through the use of unrestricted grant money from the manufacturers of the HPV vaccines, Merck Frosst and GlaxoSmithKline (GSK) in the school-based immunization program in the Capital Health district only. Youth engagement and use of peer health education strategies were objectives of the project, in an effort to promote cervical cancer awareness and promotion of the HPV vaccine. PHNs working with schools in their geographic areas had the opportunity to apply for small grants to support a cervical cancer health promotion program in the school for that school year, however design of the program was left to each school PHN and the school community, based on the needs of the school. Such a program offered a unique opportunity to explore what activities and strategies were used and to determine if any of

these strategies have had an impact on uptake of the HPV vaccine.

Model of Immunization Delivery

A collaborative practice model for immunization program delivery is used in all schools within Capital Health, which includes a public health immunization team with a coordinating role delivered by an Immunization Team Lead, who is a PHN, and Licensed Practical Nurses (LPNs) working collaboratively with the Public Health nursing staff assigned to the respective schools. PHNs typically, act as the school liaison, building relationships with principals, teachers, school personnel, and community members to establish trust in Public Health programs, including the school-based HPV immunization program (Capital Health, 2010). The LPN assigned to the school in the role of Immunization Team member works collaboratively with the PHN to promote the HPV immunization program, and coordinate the logistical functions of the mass immunization clinics (Capital Health, 2010). In this study, the strategies that were used to target schools, parents and youth were often joint collaborations between the PHNs and LPNs; when variation exists, the roles are often complementary, (i.e., PHN-led school-based health promotion campaign, LPN-led consent return follow-up) (Whelan & Humber, 2010). This model of delivery was found to be both beneficial for maintaining the relationship with the schools through the PHN and, reducing the workload of the PHN assigned to the school through the contributions of the LPN (Whelan & Humber, 2010).

Public health staffing assignment is based on a family of schools with consistent staff delivering immunization and other public health programs to schools that feed into a high-school. For example, a PHN and an Immunization Team LPN may be assigned to two junior high schools and the feeder high-school, which would be considered the

family of schools.

Population

For the 2010-2011 school year, there were 4379 females eligible for publicly funded HPV vaccine as part of the school-based immunization program offered at grade 7 and grade 8, located in the 69 schools within Capital Health (H. D'Angelo-Scott, Senior Epidemiologist, Public Health, Capital Health, personal communication, January 12, 2012). The HPV vaccine is routinely offered at grade 7 as part of the comprehensive school immunization program, however, in the preceding year the program had been placed on hold due to the influenza H1N1 pandemic, and as such, the grade 8 cohort was eligible as a catch up from the previous year (D. Mombourquette, Immunization Coordinator, Nova Scotia Department of Health and Wellness, personal communication, May 11, 2012).

The HPV vaccine is routinely available only through the school-based immunization program, and is not distributed to family physicians or other primary care providers for provision unless a medical or safety concern is identified and the vaccine is specifically released to the family practice for the student at the discretion of the Medical Officer of Health. Reciprocal notification of the HPV vaccine administered is provided by the family practice or primary care provider to public health to ensure accurate documentation of the students' immunization status, and is included in the public health data set.

To assess the relationship between program delivery factors and the completion of the three-dose HPV vaccine, the coverage data was analyzed along with information about public health nursing strategies that were used to engage schools, parents, and

youth in each of the schools.

Sample Size Calculation

A power analysis determined that a total of 388 students was required in each arm (i.e., nursing engagement strategies used to enhance vaccine uptake compared to usual practice) for comparison of two population proportions, based on improving the completion of the three dose series by 10%, with a level of significance ($\alpha = 0.05$), and power of 80 (Duffy, 2006; Kachoyeanos, 1998). If sampling from two populations, for example, suppose the first population is Group One (usual practice) and the second population is Group Two (nurse-led youth engagement group), we compare the HPV vaccine uptake of students who would have usual practice, which includes the distribution of standard provincial consent packages by PHNs, versus students in schools where youth were engaged by the PHN to be involved in the HPV immunization program through health promotion initiatives. The following formula was used to calculate the sample size:

$$n_1 = \frac{\left(\frac{z_\alpha}{2} \sqrt{\bar{p}q\left(1 + \frac{1}{k}\right)} + z_\beta \sqrt{p_1q_1 + \frac{p_2q_2}{k}}\right)^2}{(p_1 - p_2)^2}$$

where

$$p = \frac{p_1 + kp_2}{1 + k}, q = 1 - p$$

An estimate of population proportion for group one ($P_1 = 0.5$) was used as the most conservative estimate of P_1 , as there were no previous studies of the relationship between structural factors and uptake of the HPV vaccine found in the literature (R. Bartlett, Professor of Mathematics and Statistics, Memorial University of Newfoundland, personal communication, April 24, 2012). In computing the above formula, to detect a difference

of 10% in HPV vaccine uptake, $P_2 = 0.6$, we find that $n_1 \sim 387$. A typical sample size when sampling from a proportion is approximately 400 from each group (R. Bartlett, Professor of Mathematics and Statistics, Memorial University of Newfoundland, personal communication, April 24, 2012). Minitab® Student Release 14 (Prentice Hall, 2004) was used to confirm the statistical computation.

Uptake of the HPV vaccine within Capital Health for the 2010-2011 school-year ranged from 47.4% to 95% (H. D'Angelo-Scott, Senior Public Health Epidemiologist, Capital Health, June 27, 2012), which provides for more than 10% variation to detect a difference between groups for the purpose of the study. In the same year, the eligible cohort, both males and females, had a range of 54.7% to 100% for the recommended Hepatitis B vaccination series (H. D'Angelo-Scott, Senior Public Health Epidemiologist, Capital Health, June 27, 2012), which may provide some evidence that strategies used for HPV vaccine uptake were similar in engaging both males and females.

Measures

HPV immunization coverage data. The public health data set for immunization is an excel database that includes information collected by Public Health from the schools for all eligible students registered in the school for the school-year. The data set was developed by the Public Health Epidemiologist in consultation with the district Immunization Coordinator and administrative data-entry staff in the fall of 2010, based on coverage reporting requirements of the Nova Scotia Department of Health and Wellness and national guidelines for immunization coverage reporting (Mullens, 2010). Data was entered into an excel workbook from a list of students obtained from the school boards in September of the school-year and validated by the public health nurses at each

scheduled clinic at 0, 2 and 6 months. Data quality checks were conducted using standardized definitions for coding developed by the epidemiologist for the immunization data team at Capital Health. The data set was developed out of the need to analyze trends in data at the local level to inform planning for immunization programs including resource allocation, as such reports were not possible using the provincial immunization registry system, the Application for Notifiable Disease Surveillance (ANDS).

A secondary analysis of the HPV immunization coverage data was done on a select group of variables found within the Capital Health HPV school-based immunization data set for the 2010-2011 school-year. This data set included variables for all students that were eligible for the publicly funded HPV vaccine (n = 4379); data was provided to Public Health under the *Health Protection Act* (2004) from a registered list supplied by the school boards within Capital Health. The variables included in the data set were: name, age, sex, health card number, postal code, school, school type (public or private), school board, community health board, grade, type of vaccines, dates of vaccinations, route, and dose of vaccines given at 0, 2, and 6 months. For the purpose of this study, a number of variables were removed from the data set by the Public Health Epidemiologist to ensure anonymity and confidentiality. These included: name, health card number, postal code, information about vaccinations other than the HPV vaccine, and details of HPV administration that were not relevant to the study, i.e., dose, route, site and lot number of the vaccine. The variables included in the secondary data set were: age, sex (all female), school, school type, community health board, and dates of HPV dose 1, HPV dose 2, and HPV dose 3. The outcome variables: (a) HPV vaccine refusal, students who did not receive any doses of the vaccine, (b) HPV vaccine initiation,

students who received 1 or 2 doses of the vaccine, and (c) HPV vaccine completion, students who received all three doses of the HPV vaccine series, were re-coded to allow for analysis using the PASW Statistics 17 (formerly SPSS 17).

Study questionnaire. Based on best practice strategies described in the literature, and the Vaccine Acceptability and Adherence Model (Katz et al., 2011) (see Chapters 1 and 2), a structured questionnaire guide was developed for this study to identify engagement strategies used by PHNs that were successful in improving HPV vaccine uptake. The survey guide consisted of: (a) two items to identify usual practice, (b) eight items to identify youth engagement strategies, (c) nine items to identify parental engagement strategies, and (d) eight items to engage school personnel (see School-based Immunization Engagement Questionnaire; Appendix A for a full list of the questions).

The questionnaire was tested with a convenience sample of nurses with extensive experience in public health nursing; two nurses working in school-based immunization program delivery, two nurses who are involved in policy and program planning for school-based immunization program and two public health staff with experience in survey development. Consultation with experts in the field is considered an appropriate manner to determine content/face validity (Loiselle, Profetto-McGrath, Polit, & Beck, 2007). Three additional questions were added to the interview guide based on the feedback (Appendix A).

From the structured interview questionnaire, demographic information was collected from the nurses, as well as a description of their activities and strategies used to engage youth, parents and schools in the 2010-2011 HPV school-based immunization program.

Study Variables

Three dependent or outcome variables were reported in the study: HPV vaccine refusal, HPV vaccine initiation, and HPV vaccine series completion. The HPV vaccine refusal identified students that did not receive any doses of the HPV vaccine for which they were eligible. HPV vaccine initiation identified those students who received either one or two doses of the HPV vaccine, and HPV adherence was defined as completion of the three-dose HPV vaccine series.

The independent variables included engagement strategies used by public health nursing staff in schools, and were based on the Vaccine Perceptions, Acceptability, and Adherence Model (Katz et al., 2011), and a review of the literature. The information provided by the public health nursing staff in a questionnaire provided information as to which activities or strategies were used. Three categorical independent variables were explored, including the engagement of youth, parents and school personnel. Independent variables were dichotomous and were coded as “0” or “1” for the type of activity or strategy, and the targeted strategy was coded as “1”, whereas if the strategy was not used, it was coded as “0”. Table 2 presents a summary of the variables and references from the literature that support their inclusion in the study.

Data from the questionnaire was incorporated into the public health data set and coded as outlined above. The identification of the school for each student enabled the linking of the strategies utilized at a school to a student. Where students had moved within the Capital District, students were coded with strategies that would have been provided in the initial school, as most strategies to promote the vaccine are targeted at the outset of the program. For a full description of variables included in the study, see

Appendix D.

Table 2 Independent variable predictors of HPV vaccine uptake

Independent Variable	Variable Category	Support for Inclusion
Youth Engagement	youth participation in health promotion committee or ad hoc committee to promote HPV immunization program and/or cervical cancer prevention (student champion)	Brabin et al., 2010; Hammer et al., 2009; Guajardo et al., 2002; Kwan et al., 2011; Periera, 2007; RNAO, 2009; Scheve, Perkins & Mincemoyer, 2008; Suleiman et al., 2006; Tung et al, 2005; Vallely, Roberts, Kitchener, & Brabin, 2008.
	peer-health promotion in delivery of HPV immunization program, i.e. cervical cancer prevention	
	youth involvement in consent package distribution	
	youth participation in reminder announcements for consent return or clinic dates	
	youth involvement in clinic promotion and/or clinic operations during HPV immunization clinics	
	youth involved in evaluation of HPV immunization and/or cervical cancer prevention	
	pain management best practice used during immunization clinic	
	youth engagement strategies inclusive to male students	
Parental engagement	parent participation in health promotion or ad hoc committee to promote HPV immunization program and/or cervical cancer prevention	RNAO, 2009
	consent package distribution first week of school	Davis et al., 2004; Stewart et al., 1997; Cooper Robbins, Bernard, Brotherton, McCaffery, & Skinner, 2010
	nurse available to answer questions regarding HPV and HPV immunization	Hilton, Hunt, Beford, & Petticrew, 2011; Cooper Robbins et al., 2010
	parent information session held	Stretch et al., 2008; Hilton et al., 2011.
	reminder call for consent return	Mak, Bulsara, Goggin, & Effler, 2011; Hilton et al., 2011
	consent package re-sent for non-responders	Hilton et al., 2011; Cooper Robbins et al., 2010
	reminder call for missed clinic	Cawley et al., 2010; Hilton et al., 2011
	reminder letter for missed clinic	Cawley et al., 2010; Hilton et al., 2011
flexible appointments offered, i.e. home visits, catch-up clinics	Cawley et al., 2010; Hilton et al., 2011; Cooper Robbins et al., 2010	

Independent Variable	Variable Category	Support for Inclusion
School engagement	teacher or school personnel participation in health promotion or ad hoc committee to promote HPV immunization program and/or cervical cancer prevention (teacher champion)	RNAO, 2009
	communication from the schools via newsletters, emails and/or announcements on school websites	Cooper Robbins et al., 2010
	HPV and HPV vaccine information session held for teachers/school personnel	Brabin et al., 2011). Cooper Robbins et al. (2010)
	teachers or other school personnel assist with consent package distribution	Luthy et al., 2010; Tung, & Middleman, 2005
	incentives provided to teachers to assist with promotion and/or consent return (i.e. gift card, recognition of contribution, stipend for attendance at after-school workshop)	Cawley et al., 2010
	incentives provided to schools to assist with promotion and/or consent return (i.e. pizza parties, grant funding)	Cawley et al., 2010
	consents returned to teacher	Cawley et al., 2010
	thank-you provided to teacher or school personnel for recognition of contribution	Cawley et al., 2010
Usual Practice	HPV immunization consent package distribution by nurse	
	HPV immunization information/presentation provided to students by nurse	

Procedures

A letter of explanation and invitation to attend an overview of the study was sent to the Immunization Team and to all PHNs working directly with schools in the school-based immunization program in Capital Health (Appendix B). PHNs and LPNs who work most directly with the schools on immunization issues were invited to participate in a structured interview/questionnaire with the researcher, or meet to complete the interview as a team of nurses (for example, Immunization Team LPN, and PHN assigned to the school). As Streiner and Norman (1995) suggest, to reduce response bias this study

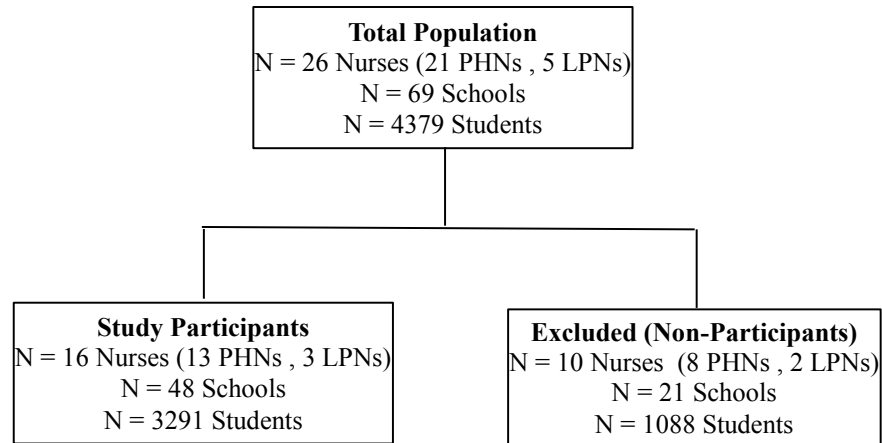
only included individuals that were interested or worked directly with the topic of interest. The researcher used the School-based Immunization Engagement Questionnaire (see Appendix A) to guide the interviews and had the nurses identify activities or strategies that were used during the 2010-2011 school year for each individual school. Having the researcher complete the interviews allowed for a consistent definition of strategies used and to clarify understanding. PHNs were provided a copy of the interview guide/questionnaire to facilitate dialogue and recall of strategies used. PHNs who were responsible for a number of schools for the HPV vaccination program in 2010-2011 were asked to answer the questions for each assigned school. Face-to-face interviews were conducted with 4 of the nurses who participated in the study and telephone interviews were done with an additional 12 participants for a total of 16 interviews.

Survey Recruitment

Overall, 26 nurses were invited (i.e., via email invitation) to participate in the survey component of the study. Of these, 16 nurses responded to the invitation to participate providing a response rate of 61.5%. The purpose of the survey was to provide detailed information on public health nursing engagement strategies targeting schools, parents and youth for the 2010-2011 school-based HPV immunization program. From the 16 nurses participating in the survey, data (i.e., on public health nursing engagement strategies) was collected for 48 (69.5%) of the 69 schools represented in the HPV data set, representing 3291 (76.3%) of 4379 females eligible for the publicly funded HPV vaccine in the 2010-11 school vaccine program. Therefore, the analysis was limited to these 3291 students (Figure 3).

Figure 3

Flow Chart of Survey Recruitment and Inclusion of Study Participants



Data Analysis

To explore the relationship between HPV vaccine uptake and nurse-led engagement strategies, descriptive and inferential statistical methods were used. Descriptive statistics including numerical and graphical methods were used to explain the sample, engagement strategies used and any pertinent demographic information. Multinomial logistic regression analysis was performed to identify nurse-led engagement engagement strategies that predicted complete, partial or no HPV vaccination for eligible students in 2010-2011.

Logistic regression is used with a categorical outcome variable and predictor variables that are continuous or categorical, and multinomial logistic regression analysis, to predict membership of more than two categories within an outcome measure (Field, 2009). Multinomial logistic regression models determine the significance of the relationship between dependent or outcome variable categories (i.e, HPV vaccine refusal, initiation and adherence) and a number of independent or predictor variables, namely, nursing engagement strategies that were targeted to parents, adolescents and school

personnel at level of significance, alpha 0.05 (Field, 2009; McClave, Benson, & Sincich, 2011). Logistic regression also provides knowledge of the relationships and strengths among the variables (Field, 2009; Moutinho & Hutcheson, 2012). Data analysis was performed using PASW Statistics 17 (formerly SPSS 17).

In multinomial logistic regression analysis, a multinomial logistic model was fitted for all the factors being considered in the model, using a maximum likelihood estimator (Field, 2009; Kwak & Clayton-Matthews, 2002; Norisus, 2010). The analysis breaks the outcome variable into a series of comparisons between two categories (Field, 2009). To build the model, a reference category is chosen from the categories of the dependent variable (Kwak & Clayton-Matthews, 2002), and for this study, completion of the three-dose HPV series (Category A) served as the reference category. As such, this study compared outcome category A, complete uptake of the HPV vaccine, with category B, initiation of the vaccine (partial completion) and the predictor variables. A second comparison was made to compare category A, complete uptake of the 3-dose schedule, with category C, HPV vaccine refusal (no HPV vaccination). The analysis provides a set of coefficients for each of the two comparisons relative to the reference category, three equations, one for each of the categories defined by the dependent variable. The three equations can be used to compute the probability that a subject is a member of each category. The effect of the explanatory variables can be assessed for each logistic model (i.e., the effect of predictor variables, x_i , on complete uptake of the HPV vaccine and refusals and the effect of x_i on partial completion compared to complete uptake, and also for the model as a whole (i.e., the effect of x_i across all categories of uptake in the sample) (Moutinho & Hutcheson, 2011; Kwak & Clayton-Matthews, 2002).

Model building. Model specification was based on variables identified through the review of best-practice literature previously discussed, and the Vaccine Perception, Acceptability, and Adherence model, and variables were included in the model building using the forward entry method. This method is recommended when variables are based on a theoretical framework, but does not provide an order for entry, as all variables are forced into the model simultaneously (Field, 2009).

The overall test of the goodness of fit of the model is based on the reduction in likelihood values for a model which does not contain any independent variables and the model that contains the independent variables. This difference in likelihood follows a chi-square distribution, and is referred to as the model chi-square. The significance test for the final model chi-square, with the independent variables added is the statistical evidence of the presence of a relationship between the dependent variable and the independent variables (Field, 2009; Kwak & Clayton-Matthews, 2002).

Individual parameter statistics were used to assess the contribution of the predictor variables in the model, using the Wald statistic, and likelihood ratio statistics. The likelihood ratio test evaluates the overall relationship between an independent variable and the dependent variable, and the Wald test statistic evaluates whether or not the independent variable is statistically significant in differentiating between two groups in each comparison (Field, 2009).

The more crucial analysis is the interpretation of the value of the odds ratio ($\text{Exp}(B)$ in SPSS), associated with each predictor (Norusis, 2010; Zhang & Singer, 2010). If the value of the odds ratio is greater than 1, then it indicates that as the predictor increases, the odds of the outcome increase; conversely a value less than 1 indicates that

as the predictor increases, the odds of the outcome occurring decrease (Field, 2009).

Model building for each of the independent variables using logistic regression analysis identifies statistically significant predictor variables for HPV uptake. A final model that included all statistically significant variables will be presented. The final model allows for future estimation and prediction estimates of HPV vaccine uptake (Field, 2009; Kwak & Clayton-Matthews, 2002).

Sample and effect size. Using a guideline provided by Field (2009), the minimum number of cases per independent variable is 10. However, guidelines provided by Green (1991), are summarized by Field (2009) based on whether you want to test the overall model, and on testing of the individual predictor variables. For the overall model, he recommends a minimum sample of $50 + 8k$, where k is the number of predictors; and for individual predictors, $104 + k$; and then use the largest of the two (Field, 2009).

For this study, there are 31 predictor variables to be included in model building. As a minimum, then, the sample size required would be 310. According to the Green principles described above, for the overall model, $50 + 8(31) = 298$, and for individual predictors, $104 + 31 = 135$. Therefore the minimum sample required is 298.

The odds ratio will be used as the effect size measure that will be reported for each of the predictor variables in the multinomial regression model (Field, 2009).

Ethical Considerations

Values and ethical responsibilities set forth by the Canadian Nursing Association (CNA) in the *Code of Ethics for Registered Nurses* (2008) and the *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans* (Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of Canada, &

Social Sciences and Humanities Research Council of Canada, 2010), were used to guide the design of this study. Ethical approval was obtained from the Capital Health Research Ethics Board (File CDHA-RS/2013-189).

Confidentiality. The public health data set for immunization and all interview responses for the study questionnaire will be stored at Public Health under the established processes for immunization data, which includes a secure file created with access granted by the IT department at Capital Health. The public health data set will be accessed only by the research team members involved in data analysis, which will include the researcher, and the Senior Public Health Epidemiologist. Access to the data was also granted to the thesis supervisor to provide academic advice on data analysis and the presentation of the research findings. On completion of the study, the data will be archived in Public Health files for 7 years, according to Capital Health policy for records retention.

Harms. Participation in this study was voluntary. Nurses received a letter of invitation and a meeting was held with interested nurses to provide an explanation of the purpose and nature of the study, the role of those participating in the study and the rights and benefits of participating. Specifically, issues of confidentiality, anonymity of results and rights of refusal were addressed. Each participant was invited to complete a written consent form prior to being interviewed (Appendix C). The anticipated risks were expected to be minimal, and mitigated by efforts to maintain confidentiality of all data used for the purpose of the study. Interviews were conducted, where requested, outside of the public health environment in a private setting agreed upon by both the informant and the investigator. All responses to the study questionnaire were confidential.

Individual nurse demographic data were summarized. Individual schools were not identified in the study.

Benefits. The study will help to highlight the important work of public health nursing staff in establishing trust in public health immunization programs by engaging with schools, families and youth. The study will serve to inform best practice strategies and identify strategies that may not serve to be significant in improving HPV vaccine uptake, which will help nurses prioritize the competing demands of their role, as was highlighted in the literature review. Nurses will have the opportunity to participate in the building of evidence for immunization best-practice.

Chapter 4 Results

The overall goal of this study was to facilitate knowledge translation (KT) with Public Health Nurses (PHNs), to identify strategies that were effective in improving uptake of the HPV vaccine in a school-based HPV immunization program. This chapter will provide a description of the eligible students included in the secondary analysis, as well as the survey participants who agreed to participate in the study. Key findings from the study will be presented as well as a description of strategies used by PHNs in the HPV immunization program to engage schools, parents and youth; identify which strategies were found to be standard practice for PHNs in engaging schools, parents and youth in the school-based HPV immunization program, and identify which strategies were significant in improving HPV vaccine uptake.

Nurse Participant Characteristics

Demographic characteristics of the nurse participants are shown in Table 3. All nurses who participated in the study (n=16) were female and were employed on a full-time (.84) basis during the school-year. Two-thirds were university educated, having a bachelor or master of nursing degree. The mean age of the participants was 43 years, with an overall average of 21 years of nursing experience (M 21.30, SD 10.04) and, more than 10 years of experience in public health nursing (M 12.32, SD 11.86). Overall, the nurse participants were assigned an average of four schools to help implement strategies to improve uptake of the HPV immunization program.

Table 3 Demographic Characteristics of Nurse Participants

Variable Characteristic	N (%)	Mean (SD)
Biological Sex		
Male	0 (0.00)	-
Female	16 (100.00)	-
Employment Status		
Full-time ^a	16 (100.00)	-
Part-time	0 (0.00)	-
Casual	0 (0.00)	-
Education Level		
Master of Nursing	2 (12.50)	-
Bachelor of Nursing	9 (56.30)	-
Post-RN PHN Program ^b	1 (6.30)	-
RN Diploma	1 (6.30)	-
Post-LPN Immunization Certificate ^c	3 (18.80)	-
Age in years		43.12 (7.41)
25 – 30	0 (0.00)	
31 – 40	7 (43.75)	
41 – 50	8 (50.00)	
51+	1 (6.25)	
Years of (Total) Nursing Experience		21.30 (10.04)
< 5	1 (6.25)	
6 – 10	2 (12.50)	
11 – 20	4 (25.00)	
21+	9 (56.25)	
Years of Public Health Nursing Experience		12.32 (11.86)
< 5	7 (43.75)	
6 – 10	3 (18.75)	
11 – 20	1 (6.25)	
21+	5 (31.25)	
Number of Schools Assigned		4.31 (4.19)
< 2	3 (18.75)	
2 – 5	10 (62.5)	
6 – 10	1 (6.25)	
10+	3 (18.75)	

Note. N = 16, LPN = Licensed Practical Nurse

^aAll PHNs that participated in the study worked full-time hours during the school-year, but are paid at 0.84, as they do not work during the summer months.

^bPost-RN PHN Program is a 1 or 2 year post-RN program that focuses specifically on competencies required for public health nursing.

^cPost-LPN Immunization Certificate is a 60-hour post-graduate diploma for licensed practical nurses at the Nova Scotia Community College which provides competency training specific to immunization practice.

As the HPV school-based immunization program is delivered through a collaborative practice model (as discussed in Chapter 3), the PHN assigned to the school to promote the program acts as the school-liaison to promote the immunization program and develop the relationships necessary for the support of all public health programs delivered in schools, and the geographic community. The number of schools to promote the HPV immunization program with most PHNs ranged from 2-5. The LPN working on the immunization team works collaboratively with the PHN to deliver the school-based immunization program in schools, ranging from 10-13 schools. From the interviews, PHNs and LPNs were able to describe the different strategies used for different schools, highlighting the importance of the engagement of school principals, teachers or other champions within the school as critical to the success of the program.

Eligible Student Participants in the HPV Immunization Program

Data was collected that described strategies used with 3219 (76.3%) of 4312 eligible participants in the school-based immunization program. As the program was only targeting a female cohort, all of the 3219 eligible participants included in the study were female, with a mean age of 13.7 years (Table 4). The majority of the participants attended a public school (91.9%) in an urban location (74.7%).

Table 4 Characteristics of Eligible Student Participants in the HPV Immunization Program

Variable Characteristic	N (%)	Mean (SD)
Age in Years	3291(100)	13.72 (.65)
School Type ^a		
Public	3024 (91.9)	-
Private	267 (8.1)	-
School Location		
Urban	2460 (74.7)	-
Rural	831 (25.3)	-

Note: SD = standard deviation.

^aComparison of English and French Language Schools was not completed to maintain participant anonymity

Uptake of the HPV Vaccine in Study Participants

The completion percentage of the 3-dose HPV series and overall vaccine uptake for schools included in the study was similar to the schools that were not included in the study, with a mean of 73.19% and 71.53% respectively (Table 5). This indicates that strategies used in the schools participating were similar to those used by PHNs in schools that were excluded from the study, minimizing non-responder bias (Loiselle, Profetto-McGrath, Polit, & Beck, 2007).

Table 5 HPV Uptake for Eligible Participants: Included Schools vs. Excluded Schools

Eligible Participants	Percentage HPV Completion, by school, M (SD)	Percentage HPV Uptake, by student, N (%)			
		Refusal	Initiation	Completion	Total
Excluded Schools	73.19 (25.3)	177 (16.3)	78 (7.2)	833 (76.6)	1088
Included Schools	71.53 (11.0)	553 (16.8)	297 (9.0)	2441 (74.2)	3291
Total		730 (16.7)	375 (8.6)	3274 (74.8)	4379

Overall, 74.2% (2441 of 3219 students) completed the 3 doses HPV vaccine series; 9.0% (297) initiated the HPV vaccine but did not complete, and 16.8% (553) received zero doses of the 3-dose HPV vaccination series (Table 6). Thus, 89.15% of girls who initiated the vaccine completed the vaccine series.

Table 6 Characteristics of Eligible Student Participants and HPV uptake

Characteristic	HPV Uptake, N (%)		
	Refusal (0 doses)	Initiation (1-2 doses)	Completion (3 doses)
School Type			
Public	481 (15.9)	277 (9.2)	2266 (74.9)
Private	72 (27.0)	20 (7.5)	175 (65.5)
School Location			
Urban	410 (16.7)	220 (8.9)	1830 (74.4)
Rural	143 (17.2)	77 (9.3)	611 (73.5)
Total	553 (16.8)	297 (9.0)	2441 (74.2)

Note. N = 3291

Strategies Used by PHNs in the HPV Immunization Program

Findings from the interview questionnaire show a variation in the strategies used by PHNs to promote the HPV school-based immunization program (Figure 4). Table 7 provides a ranking of strategies by percent used with students to help promote the HPV vaccine. The results show that PHNs consistently used similar strategies with grade 7 and 8 students (99.8%) during the study period, engaged teachers in the consent return process with almost all students (99.0%), and provided communication information to schools to include in their newsletters, emails or on their website (98.9% of students). Few PHNs engaged parents through the use of reminder letters for students who missed an immunization clinic (targeting only 2.9% of students), or engaged youth in the consent package distribution process (4.5% of students).

Figure 4 Histogram of Strategies Used with Students by PHNs in Schools

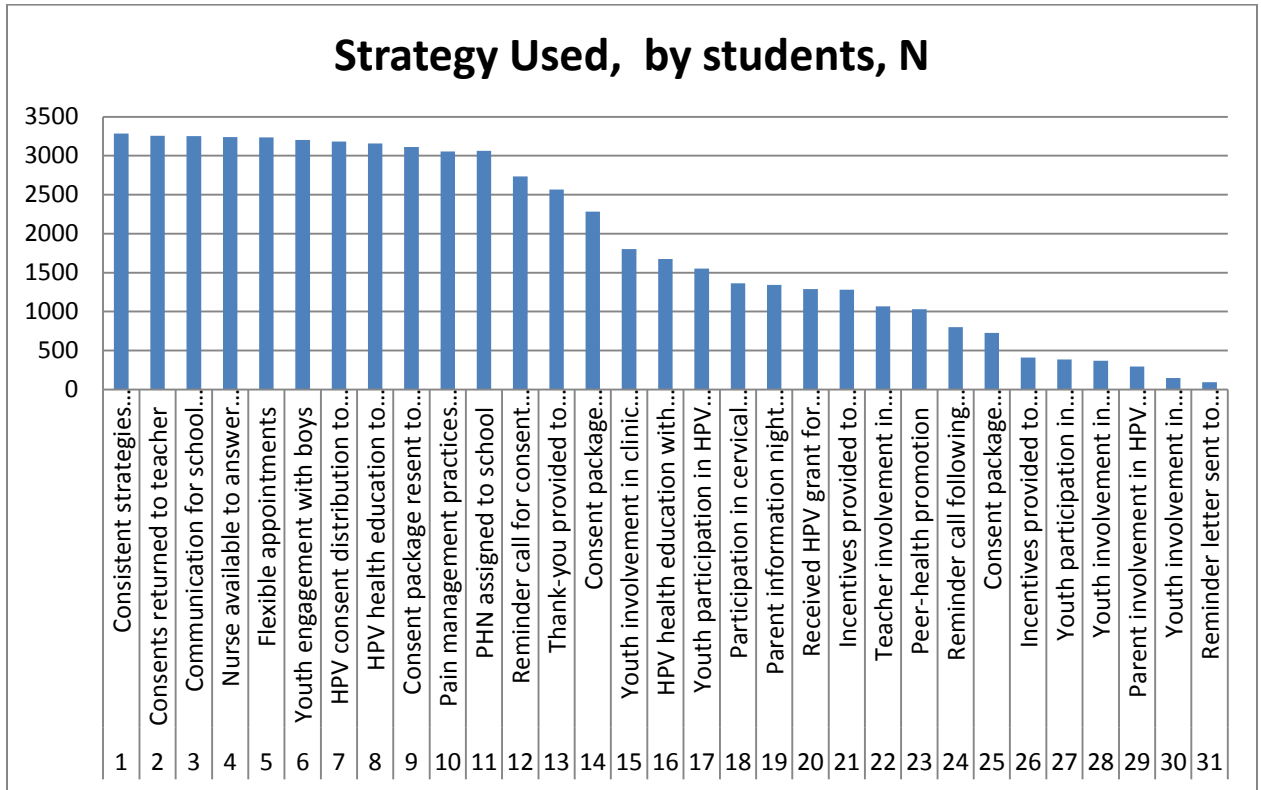


Figure 4. Histogram of ranking of strategies used by PHNs with students, N = 3291.

Table 7 A Ranking of Strategies by Percent Used with Students by PHNs in Schools

Rank	Strategy Variable	Strategy Used, by students, N (%)
1	Consistent strategies targeting grade 7 & 8	3284 (99.8)
2	Consents returned to teacher	3258 (99.0)
3	Communication for school newsletter, emails, website	3254 (98.9)
4	Nurse available to answer questions	3240 (98.5)
5	Flexible appointments	3234 (98.3)
6	Youth engagement with boys	3201 (97.3)
7	HPV consent distribution to students	3183 (96.7)
8	HPV health education to students	3159 (96)
9	Consent package resent to students for consent return	3114 (94.6)
10	Pain management practices used during clinic	3057 (92.9)
11	PHN assigned to school	3064 (93.1)
12	Reminder call for consent return	2735 (83.1)
13	Thank-you provided to teacher	2565 (77.9)
14	Consent package distribution by teacher	2284 (69.4)
15	Youth involvement in clinic promotion or operations	1803 (54.8)
16	HPV health education with teachers	1677 (51.0)
17	Youth participation in HPV health promotion committee	1552 (47.2)
18	Participation in cervical cancer health promotion campaign	1362 (41.4)
19	Parent information night held, i.e. curriculum night	1343 (40.8)
20	Received HPV grant for health promotion	1290 (39.2)
21	Incentives provided to schools, i.e. grant funding	1279 (38.9)
22	Teacher involvement in HPV health promotion committee	1068 (32.5)
23	Peer-health promotion	1031 (31.3)
24	Reminder call following missed clinic	801 (24.3)
25	Consent package distribution during first week of school	726 (22.1)
26	Incentives provided to teachers	410 (12.5)
27	Youth participation in announcements for consent return	385 (11.7)
28	Youth involvement in evaluation of campaign	367 (11.2)
29	Parent involvement in HPV health promotion committee	296 (9.0)
30	Youth involvement in consent package distribution	148 (4.5)
31	Reminder letter sent to parents for missed clinic	94 (2.9)

Multinomial Logistic Regression Model

Prior to running the multinomial logistic regression, bivariate analysis, frequencies and cell counts of all included variables (n=31) were used to provide supportive information for model building. Of the 31 variables collected, 7 variables were not included in the analysis. Using a guideline provided by Field (2009), the minimum number of cases per independent variable is 10; as such, number counts less than 10 indicated that a reliable comparison of groups could not be made, and therefore

the variables were removed from the analysis. In this study, the number of cases referred to the number of students for which data was included for analysis. Therefore, where there were less than 10 students in a category of uptake for the variable, those variables were excluded from the analysis. See Table 8 for an overview of variable exclusion.

Table 8 Excluded Variables from Nursing Questionnaire

Variable	HPV Uptake, N (%)			Total
	Received 0 doses	Received ≥ 1 dose	Received ≥ 3 doses	
HPV health education to students				
Strategy Used	535 (96.7)	292 (98.3)	2332 (95.5)	3159 (96.0)
Strategy Not Used	18 (3.3)	5 (3.8)	109 (4.5)	132 (4.0)
HPV consent distribution to students				
Strategy Used	546 (98.7)	292 (98.3)	2345 (96.1)	3183 (96.7)
Strategy Not Used	7 (1.3)	5 (1.7)	96 (3.9)	108 (3.3)
Youth engagement with boys				
Strategy Used	525 (94.9)	291 (98.0)	2385 (97.7)	3201 (97.3)
Strategy Not Used	28 (5.1)	6 (2.0)	56 (2.3)	90 (2.7)
Nurse available to answer questions				
Strategy Used	546 (98.7)	292 (98.3)	2402 (98.4)	3240 (98.5)
Strategy Not Used	7 (1.3)	5 (1.7)	39 (1.6)	51 (1.5)
Flexible appointments				
Strategy Used	544 (98.4)	290 (97.6)	2400 (98.3)	3234 (98.3)
Strategy Not Used	9 (1.6)	7 (2.4)	41 (1.7)	57 (1.7)
Communication for school newsletter, emails, website				
Strategy Used	547 (98.9)	295 (99.3)	2412 (98.8)	3254 (98.9)
Strategy Not Used	6 (1.1)	2 (0.7)	29 (1.2)	37 (1.1)
Consistent strategies used for grade 7 and 8 eligible students				
Same Between Grades	552 (99.8)	297 (100.0)	2435 (99.8)	3284 (99.8)
Difference Between Grades	1 (0.2)	0 (0.0)	6 (0.2)	7 (0.2)

The excluded variables represent what was described as ‘standard practice’ for PHNs in the HPV immunization program, including: providing a HPV health education session and consent information package to students, including males in health education

and health promotion activities, having a nurse available to answer questions, offering flexible appointments, providing communication information for the school newsletter, emails, or website, and using consistent approaches targeting both grade 7 and 8 students. These 7 strategies were used with 93.8 – 97.9 % of schools, and targeted 96.0 – 99.8% of students included in the study (Table 9).

Table 9 Strategies Used in Schools as 'Standard Practice'

Strategy Variable	Strategy Used, by Schools, N (%)	Strategy Used, by Students, N (%)
HPV health education to students	45 (93.8)	3159 (96)
HPV consent distribution to students	47 (97.9)	3183 (96.7)
Youth engagement with boys	46 (95.8)	3201 (97.3)
Nurse available to answer questions	47 (97.9)	3240 (98.5)
Flexible appointments	46 (95.8)	3234 (98.3)
Communication for school newsletter, emails, website	46 (95.8)	3254 (98.9)
Consistent strategies targeting grade 7 & 8	46 (95.8)	3284 (99.8)

Note: N = 48 schools and 3291 students included in the study

Once these, 7 variables were excluded; a step-wise multiple logistic regression analysis using a forward selection procedure was used to fit a model to the data using PASW Statistics 17 (formerly SPSS 17) to explore the relationship between the remaining 24 nursing strategies and uptake of the HPV vaccine (Field, 2009; Kwak & Clayton-Matthews, 2002).

Final multinomial logistic regression analysis revealed that two nursing engagement strategies targeting schools, and two strategies targeting parents were significantly related (at significance level of $p < .05$) to initiation of the HPV vaccination series (Table 10).

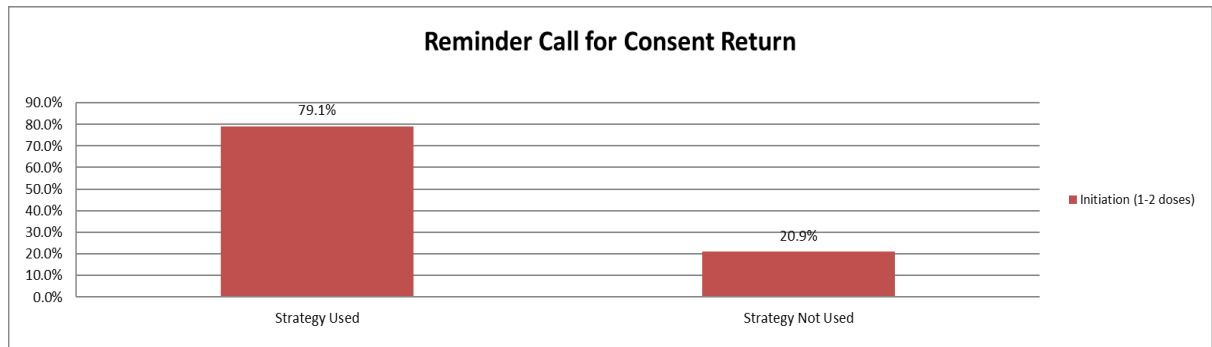
Table 10 Final Multinomial Logistic Regression Model for Public Health Nursing Engagement Strategies and Uptake of the HPV vaccine in a School-Based Immunization Program

Model Variable	Received ≥ 1 dose		Received ≥ 3 doses	
	OR	95% CI	OR	(95% CI)
Reminder call for consent return	1.63*	[1.09, 2.42]	0.89	[0.68, 1.17]
Reminder call for missed clinic	0.56**	[0.38, 0.83]	1.02	[0.78, 1.32]
HPV health education to teachers/school personnel	0.40***	[0.55, 0.29]	1.07	[0.87, 1.31]
Consents returned to teacher	1.96	[0.49, 7.69]	3.22**	[1.47, 7.14]
Thank you provided to teacher/school personnel	2.38***	[1.58, 3.57]	1.2	[0.92, 1.56]
PHN assigned to school	1.03	[0.55, 1.93]	1.65*	[1.07, 2.55]

Note: CI = confidence interval; HPV = human papillomavirus; OR = odds ratio. Reference category is no doses, $R^2 = .024$ (Cox & Snell), $.031$ (Nagelkerke). Model $\chi^2(12) = 78.816$, $p < .001$. * $p < .05$, ** $p < .01$, *** $p < .001$.

The model revealed a significant relationship (p value = .017) between the use of “reminder calls” by nurses to promote consent return and receiving ≥ 1 dose of the HPV vaccine. Within this model, the odds ratio of initiating the vaccine was 1.6 times greater among students who received reminder calls for consent return (OR = 1.625, 95% CI 1.089 – 2.424). When this strategy was used, it was significant in improving initiation of the vaccine with 79.1% of students (Figure 5).

Figure 5 Histogram showing uptake of at least one dose of HPV Vaccine by 'Reminder Calls for Consent Return'



Initiation of the HPV vaccination series was also significantly related to parents receiving a reminder call following a missed clinic (p value = .004). Reminder calls following a missed clinic are directed to those that did not receive the first dose of the vaccine (OR= 0.56, 95% CI 0.376 - 0.834), and when the reminder call was used following a missed clinic, the PHN was successful in recruiting 24.2% of those students to then receive the vaccine (Figure 6).

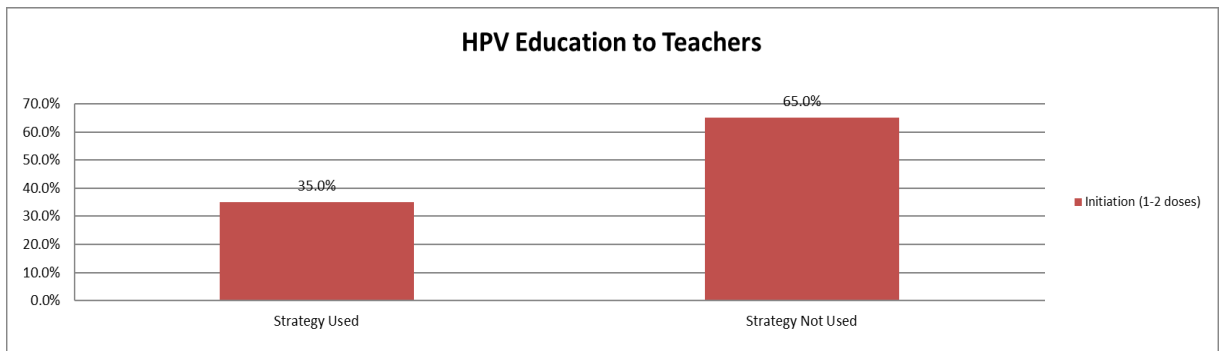
Figure 6 Histogram showing uptake of at least one dose of HPV Vaccine by 'Reminder Calls Following a Missed Clinic'



The analysis revealed a significant relationship between the provision of a HPV health education session to teachers and school personnel and initiation of the HPV vaccine (p value < 0.001). Nurses provided this additional education to teachers in

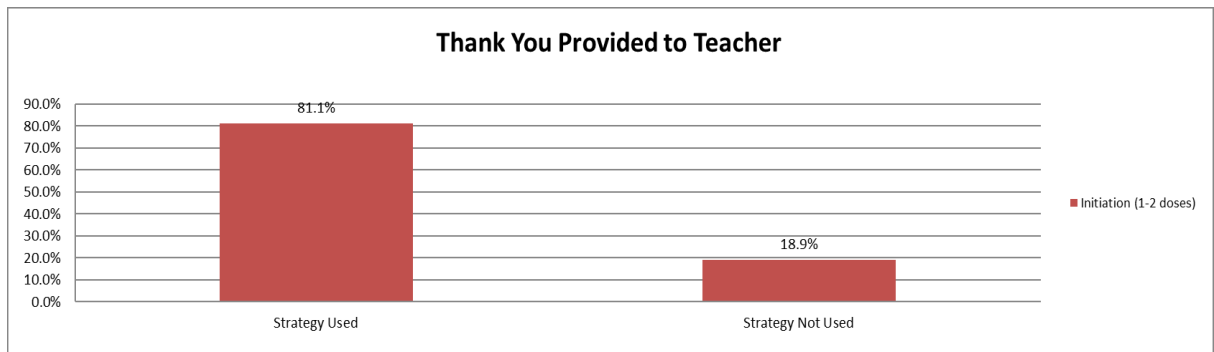
schools where the students were almost 2.5 times less likely to start the vaccination series (OR = 0.404, 95% CI 0.558 – 0.293). Figure 7 shows that PHNs provide a HPV health education session in schools where they anticipate low uptake of the vaccine, and are successful in improving initiation of the vaccine with 35% of the students.

Figure 7 Histogram showing uptake of at least one dose of HPV Vaccine by ‘HPV Health Education Session to Teachers’



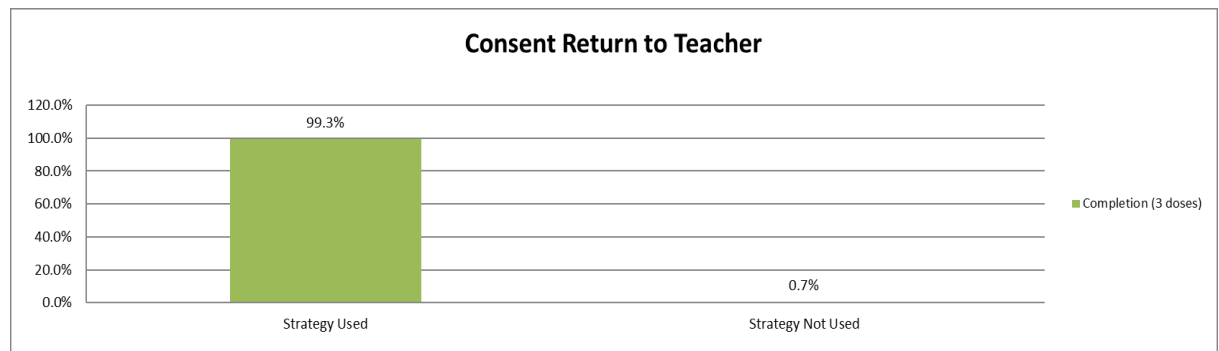
A significant relationship was revealed between the provision of a “thank-you to the teacher” or “school personnel” and the students receiving ≥ 1 dose of the HPV vaccine (p value < 0.001). When a “thank you” was given to the teacher, students were more than twice as likely to initiate the vaccine series. When a “thank you” was not provided however, students were less likely to start the vaccine (OR = 2.37, 95% CI 3.58 -1.577). When a thank-you was provided, 81.1% of the students started the HPV vaccine (Figure 8).

Figure 8 Histogram showing uptake of at least one dose of HPV Vaccine by 'Thank-you to Teacher'



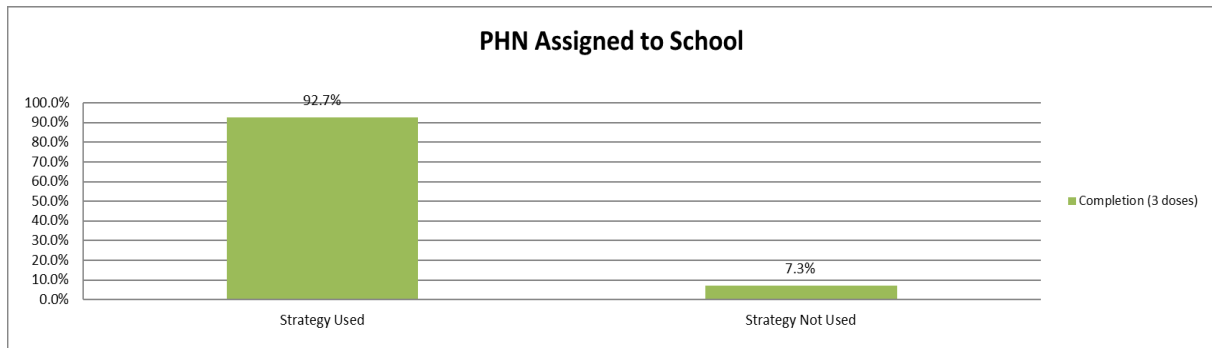
Two strategies were found to be significantly related to completion of the three-dose HPV series. First, when the HPV consents were returned to the teacher (p value = 0.003), students were three times more likely to receive ≥ 3 doses (OR = 3.225, 95% CI 1.7042 – 1.481). When consents were returned to the students' teacher, 99.3% completed the 3-dose series (Figure 9).

Figure 9 Histogram showing complete uptake of the HPV Vaccine by 'Consent Return to Students' Teacher'



Second, where there was a PHN assigned to the school within the collaborative practice model, along with an LPN, students were significantly more likely (p value = 0.025) to complete the HPV vaccination series (OR = 1.647, 95% CI 1.066 – 2.545). Where there was a PHN assigned to the school, 92.7% of students completed the 3-dose HPV series (Figure 10).

Figure 10 Histogram showing complete uptake of the HPV Vaccine by 'PHN Assigned to School'



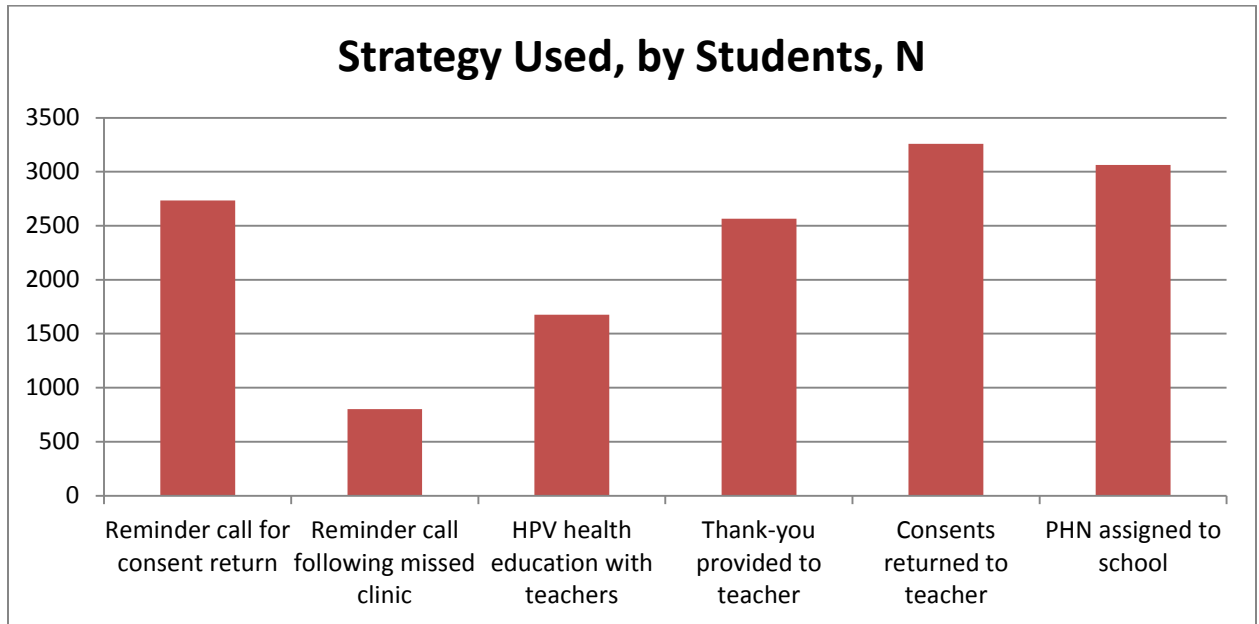
From Table 11 and Figure 11 we see that engaging parents through the use of reminder calls for consent return were used with 77.1 % of schools, targeting 83.1% of students. Reminder calls to parents for missed clinics were used less frequently, with only 29.2 % of schools, reaching 24.3% of students. In engaging schools, PHNs provided a HPV health education session with only 41.7% schools, with a target of 51.0% students, and engaged teachers through the use of a thank-you in 72.9% of schools, and a target of 77.9% students included in the study. PHNs engaged teachers to participate in consent return processes in most schools (95.8%), targeting 99% of students, and worked within a full collaborative practice model by which both a PHN and LPN were assigned to promote the program was found in 85.4% of schools, targeting 93.1% of students.

Table 11 Strategies Used in Schools Shown to Significantly Improve HPV Vaccine Initiation and Completion

Strategy Variable	Strategy Used, by Schools, N (%)	Strategy Used, by Students, N (%)
Reminder call for consent return	37 (77.1)	2735 (83.1)
Reminder call following missed clinic	14 (29.2)	801 (24.3)
HPV health education with teachers	20 (41.7)	1677 (51.0)
Thank-you provided to teacher	35 (72.9)	2565 (77.9)
Consents returned to teacher	46 (95.8)	3258 (99.0)
PHN assigned to school	41 (85.4)	3064 (93.1)

Note: significance level of $p < .05$

Figure 11 Histogram of Strategies Used in Schools Shown to Significantly Improve HPV Vaccine Initiation and Completion



In summary, the analysis of the data has shown that a number of PHN engagement strategies targeting schools and parents are significant in improving uptake of the HPV vaccine in a school-based program. There were no significant differences in model variables when type and setting of schools were considered. None of the variables describing the engagement of youth in the HPV vaccination program showed any significant effect (p value < 0.05).

Chapter 5 will present a discussion of the findings of the study, based on the results presented. The discussion will highlight what was found to be standard practice for PHNs in the HPV school-based immunization program, some key learning of what is effective in improving uptake of the HPV vaccine in a successful program, and recommendations provided for practice considerations, policy implications, and future research.

Chapter 5 Discussion

This study provided an opportunity to examine strategies used by PHNs, in an effort to determine which strategies if any, were effective in improving HPV vaccine uptake. More specifically, this study examined the relationship between PHN-led strategies and, HPV vaccine refusal, uptake (1 or 2 doses) and adherence (3 doses) among adolescent girls during the 2010-2011 school year. Data was analyzed via a secondary analysis of public health data, and a structured interview questionnaire with PHNs. The results of the study show that a number of strategies used to engage schools, parents and youth have become standard practice for PHNs in the HPV school-based immunization program, being used with over 96% of students included in the study. Further, the study suggests that strategies used to engage parents and schools were effective in helping to improve uptake of the HPV vaccine in the school-based immunization program; whereas strategies that were used to engage youth did not show an effect. This study provides further evidence, of the importance of the relationship between the school and the school nurse for a successful HPV program.

Engagement Strategies as Standard Practice

The results of the questionnaire suggest that there are a number of strategies to engage youth, parents and schools that are considered standard practice within the school-based immunization program. Across schools public health nursing staff provided a HPV health education session to 96% of the eligible students in the classroom, while at the same time distributed the HPV information and consent packages to 96.7% of the students. PHNs also included boys in HPV health education or peer health promotion activities for 97.3% of the time, despite the fact that boys were not eligible for the

vaccine within the school-based immunization program in Nova Scotia within the study period.

In targeting parents, across schools PHNs typically, were available 98.5% of the time to answer questions regarding HPV and HPV immunization, through an immunization phone line or through the school via flexible appointments to accommodate the needs of the students and parents (i.e. pick-up clinics at the school, office appointments or home visits for eligible students). Parents and schools also were engaged through communication provided by the nurse through the use of the school newsletter, emails and school website.

To our best knowledge, this was the first study that identified ‘standard practice’ strategies used by PHNs within a HPV school-based immunization program. Although these practices are not based within the context of a practice-based policy, many of the nurses in this study have had experience in successful school-based immunization programs for the duration of their years in public health nursing practice. This study highlights the importance of their autonomy in deciding strategies to target schools, parents and youth to improve HPV vaccine uptake.

Engagement of Parents

The study findings revealed that engaging parents through the use of reminder calls for consent return will improve uptake of the HPV vaccine, improving the odds of the student starting the 3-dose HPV vaccination series. Furthermore, using reminder calls to target those who miss the first dose of the vaccine at the school-based immunization clinic were also effective. This finding is consistent with a study that examined a school-based HPV program in the UK by Hilton et al. (2011) and found that reminder calls by

nurses helped to reach students located in deprived areas. Cooper Robbins et al. (2010) described the use of reminder calls as beneficial especially when vaccination information about HPV did not reach some parents. Having the consent information package not reach parents when it was sent home with the eligible student was also described by some of the PHNs in the current study. Although previous studies were not found to evaluate the effect of the use of reminder calls on the uptake of the HPV vaccine, a systematic review of factors associated with HPV vaccine uptake, found that parental satisfaction was significantly associated with the amount and quality of HPV information provided (Kessels et al., 2012). A Canadian study evaluating the Hepatitis B program found that uptake improved significantly for those who received a follow-up call (Stewart et al., 1997). It is likely, that parents who receive a reminder call, are offered the opportunity to discuss the vaccine and have their questions answered. Previous studies suggest that vaccine uptake is positively associated with having heard about the vaccine and, discussing the vaccine with a health care provider (Kessels et al., 2012).

Other strategies to engage parents in the HPV school-based immunization program showed no effect on uptake of the vaccine. These included: engaging parents in a school-based committee to promote cervical cancer awareness and the HPV vaccine and, having a parent HPV information session at the school. These findings are consistent with other studies that found parent information sessions not effective in improving uptake (Stretch et al., 2008) or positively influencing HPV vaccine decision making (Hilton et al., 2011).

Additionally, timing of consent distribution, re-sending a consent and information package, or sending a reminder letter showed no effect on uptake of the vaccine in this

study. In other studies, providing written HPV vaccine information to parents had mixed effects on acceptability of the vaccine (Stretch et al., 2008; Mak et al., 2011). Stretch et al. (2008) found that providing parents with a fact sheet did not improve uptake, whereas Mak et al. (2011) found that resending an information and consent package home with the student had a significant effect on consent return rate.

The results of this study suggest that further exploration of strategies utilizing parental engagement in the informed consent process, in particular, warrants further study.

Engagement of Schools

The findings from this study suggest that the relationship between the nurse and the school is important in the initiation and completion of the HPV vaccine in a school-based immunization program. Brabin et al. (2011) found that vaccine uptake was higher when the initiative was seen as a joint responsibility between the school nurse and the school, and teachers played a key role in promotion of the vaccine. In this study, a HPV health education session with teachers and/or school personnel, (i.e., principals) was offered in schools where the students were less likely to have started the vaccination series. It is likely that PHNs target additional efforts to teachers and principals in schools where they anticipate low uptake of the vaccine. The study also revealed that when teachers are provided with a thank-you for their participation in the HPV program, students are more likely to initiate the vaccine. Where a thank-you was described by the PHNs, it was described as a thank-you card or email at the end of the school-year, indicating the overall percentage of HPV uptake for the school and thanking the school teacher or other school personnel (i.e., principal) for their role in the success of the

program. It is possible that where PHNs have provided a thank-you to teachers, they may have also done so in previous years, as the study period was the third year of a successful HPV immunization program. It is likely that if teachers felt appreciated for their role in the success of the program, they are more likely to promote the HPV vaccine program in subsequent years. Although this study is the first to have such a finding related to the HPV immunization program, other successful school-based immunization programs (Hepatitis B and influenza), describe the provision of a written thank-you to teachers that describes their role in the success of the program, (i.e., informing them of coverage rates) as best practice (Cawley et al., 2010).

In this study, the completion of the three-dose HPV vaccine was significantly related to the return of the consent forms to the students' teacher. This is consistent with the findings identified by Brabin et al. (2011) that suggested teachers who were engaged in providing vaccine related education and in collecting the consents, were promoting the vaccine. Cooper Robbins et al. (2010) also found that teachers played an important role in mediating fears related to the HPV vaccination program. Further exploration of the role PHNs play in targeting strategies specifically to engage teachers would provide more insight into the role they play in improving uptake.

Studies that examined consent return rate in a Hepatitis B vaccination program found that consent return rate was higher when teachers were involved in promotion of the program as well as with educational package distribution (Luthy et al., 2010; Tung, & Middleman, 2005). Although this study did not use consent return rate as an outcome variable, the findings suggest that teachers may have influenced student completion of the three-dose series by promoting the program through their role in the collection of the

consents from the students. The study however, did not show any significant effect on uptake when the teachers provided the HPV information packages.

In this study, completion of the HPV vaccine series was also, significantly related to having a PHN assigned to a school. Within the context of the study setting, the HPV immunization program is delivered through a collaborative practice model which includes a PHN assigned to a school to act as the school liaison, and an immunization team of LPNs which coordinate school-based immunization clinics for all schools within Capital Health. The finding suggests that when a PHN is assigned to a school to promote the HPV vaccine, within the context the collaborative model (i.e., both a PHN and an LPN are assigned to the school), HPV uptake is improved. Where a PHN was not assigned to a school; for example, due to a maternity leave, retirement or other staff turnover; students were less likely to complete the 3-dose vaccination series. This finding suggests that the PHN plays a critical role in the development of the relationship with the school and the success of the HPV immunization program. The study findings are consistent with previous studies that have found that a recommendation of the HPV vaccine by a nurse or another health care provider is a strong predictor of vaccine acceptability (Brewer & Fazekas, 2007; Ogilvie et al., 2007) and uptake of the vaccine (Kessels et al., 2012). Also, with vaccine safety concerns being highlighted as the number one barrier to acceptability of the HPV vaccine with parents (Black et al., 2009; Ogilvie et al., 2007; Kessels et al., 2012; Zimet et al., 2006) and adolescents (Caskey et al., 2009; DiGiuseppe et al., 2008), this study further highlights the important role PHNs play in establishing trust in public health programs, in particular the HPV immunization

program. As such, it would be helpful to examine more closely the unique role PHNs play in engaging schools in HPV school-based immunization programs.

Youth Engagement

Although a number of engagement strategies with youth were identified as standard practice, (i.e., providing a HPV health education session and consent information package to eligible students including boys), none of the strategies included in the analysis showed any effect on uptake of the vaccine. In particular, although a Cervical Cancer Health Promotion Campaign was launched during the study period, to engage youth, and a number of creative initiatives were described by the PHNs interviewed for the study, none of those strategies outlined as part of the health promotion campaign were significant in improving HPV vaccine uptake. A number of previous studies suggest that by involving youth in health projects, the empowering process results in the development of more effective programs and, better adherence to these programs (RNAO, 2009; Scheve, Perkins, & Mincemoyer, 2008; Suleiman et al., 2006). This observation, however, was not found in this study. No previous studies have evaluated the impact of youth engagement on the uptake of the HPV vaccine. This finding suggests that some of the strategies used to engage youth were not effective, however other benefits of engaging youth may have been seen (for example; leadership development, empowerment), but were outside the scope of this evaluation.

Although youth engagement has been used as a strategy to improve the health of youth and reduce disparities (Scheve, Perkins, & Mincemoyer, 2008; Suleiman et al., 2006), the results of this study suggest that factors other than nursing strategies may have played a greater influence on uptake of the HPV vaccine, when such engagement

strategies with youth occurred. Previous studies have shown that socioeconomic and other factors such as geographic location, vaccine availability and cost, ethnicity and education level also impact HPV vaccine uptake (Brabin et al., 2008; Huges et al., 2009; Katz et al., 2010; Kessels et al., 2012; Roberts et al., 2011). As well, given the developmental stage of the students, (i.e., an average age of 13 years) it is likely that parents have a much greater influence on the decision to receive the vaccine. Having two significant strategies to engage parents has shown to improve uptake of the HPV vaccine with their daughters. Other studies found that where parents engaged their daughters in conversations about the HPV vaccine, uptake was improved (Cooper Robbins et. al, 2010; Mathur, Mathur & Reichling, 2010).

The Vaccine Perceptions, Acceptability and Adherence Model

The findings of this study suggest that a number of public health nursing strategies can be included in the Vaccine Perceptions, Acceptability and Adherence Model developed by Katz et al. (2010) as facilitators of HPV vaccine initiation and completion, in particular, in the context of school-based HPV immunization programs. The findings of the study suggest that having PHNs engage teachers in the HPV immunization program, and providing a thank-you note in appreciation of their role in promoting the vaccine may act as a facilitator to initiation of the vaccine (or vaccine acceptance, as described in the model). Also, where PHNs engage parents through reminder calls for consent return and for students who miss a school-based immunization clinic at “point of care” may remove barriers and facilitate initiation of the vaccine (vaccine acceptance). When PHNs are assigned to schools to promote the HPV immunization program, and engage teachers in the process of gathering the completed

consents from eligible students, more students complete the three-dose HPV vaccine series. This is described in the model as vaccine adherence, and PHNs play an important role in the context of successful school based HPV Immunization programs (Figure 12).

Figure 12 Vaccine Perceptions, Acceptability and Adherence Model (Revised)

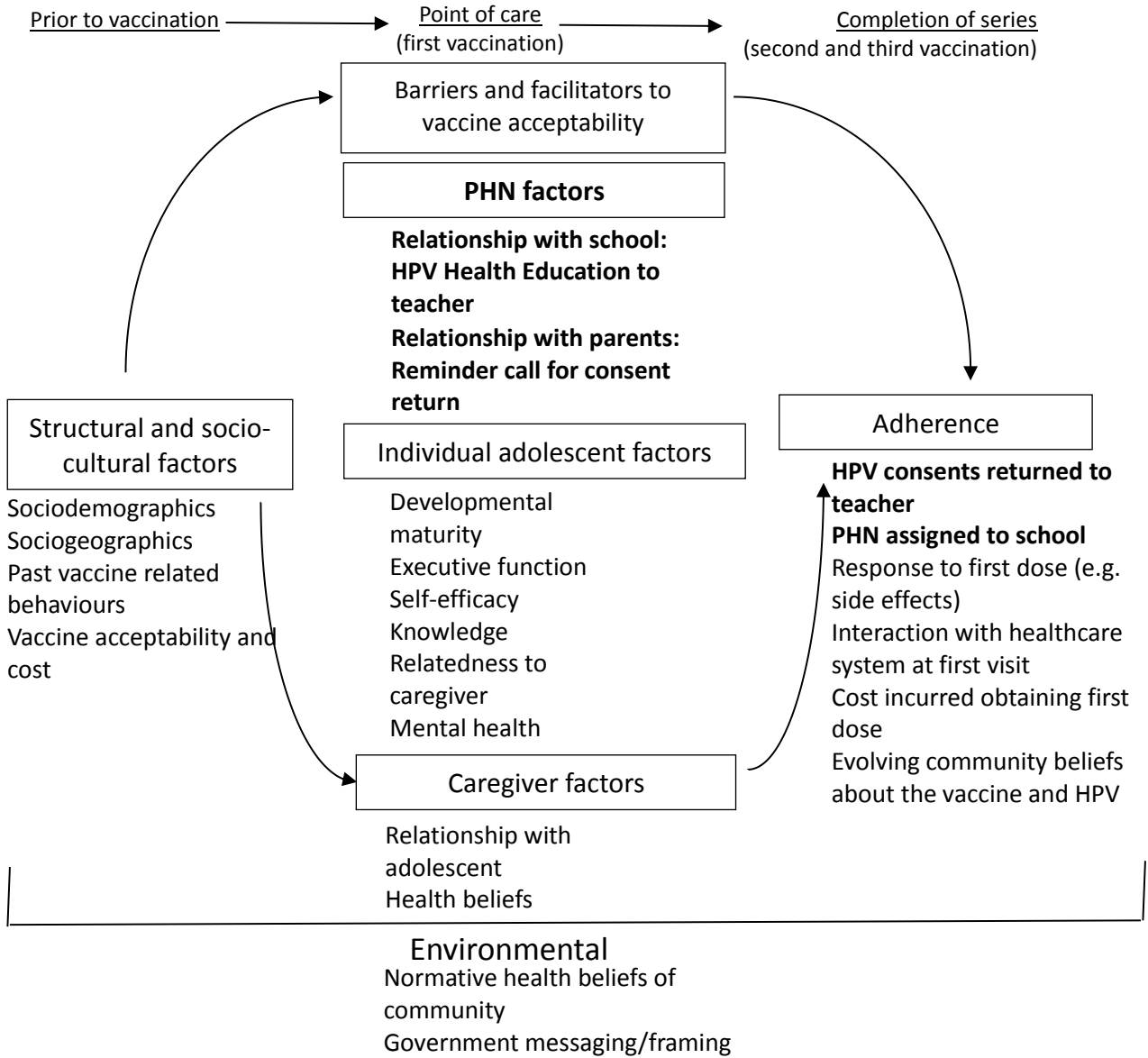


Figure 11. PHN Factors identified as predictive of vaccine acceptance (initiation of 1-2 doses of vaccine) and adherence (completion of 3-dose HPV series) in context of school-based immunization program. Adapted from “Vaccine Perceptions, Acceptability and Adherence Model,” by I.T. Katz, N.C. Ware, J.E. Haberer, C.A. Mellins, and D.R. Bangsberg, 2010, Sex Health, 7, p. 286, <http://www.publish.csiro.au/nid/164/paper/SH09130.htm>. Copyright CSIRO 2010. Revised with permission.

Study Limitations

Several limitations should be noted when considering the findings of this study. Although the data represented strategies used among 76.3% of eligible students, it was not a complete picture of what occurred within the entire eligible population. This study sample represented a proportion of a cohort of eligible females in a large, primarily urban, location in Nova Scotia, and a complete analysis of the study sample socio-demographics profile was not completed. As such, the study sample may not represent the eligible HPV recipients in other jurisdictions for which PHN strategies would be employed within a school-based HPV immunization program. Also, as HPV immunization programs are expanded to include males, although PHNs reported including males in most strategies used to promote the HPV vaccine, a more complete analysis would be required to understand more fully, strategies effective in improving uptake of the HPV vaccine with the male population.

The data collected to provide detailed information on the strategies used by PHNs was collected using a self-report questionnaire, and were therefore dependent upon the nurses' recall. This may have introduced recall bias (Streiner & Norman, 1995). Also, PHNs who did not respond to the invitation to participate in the study did not contribute to the data about the strategies that they implemented to improve HPV vaccine uptake which may have impacted the results to an unknown degree. Further, in addition to recall biases, PHNs may have both intentionally and/or unintentionally provided incorrect responses to the structured questionnaire, providing what was perceived as socially desirable answers to the questions (Streiner & Norman, 1995). It is hoped that due to the low turnover in the public health nursing staffing, the unique characteristics of the

program for the study period, (i.e. program offered to grade 7 and grade 8, and only year of a cervical cancer health promotion campaign), and the use of a structured interview versus written questionnaire format that recall and social desirability bias were minimized (Streiner & Norman, 1995).

As there were few previous studies that examined public health nursing strategies and uptake of the HPV vaccine, the structured interview guide and questionnaire tool used with the nurses was developed to garner this information for the study. Although the strategies included in the questionnaire were based on prior research, as well as a theoretical framework (Katz et al., 2010), and were reviewed for content validity (Gibbon, 1998), the list of strategies may not have been comprehensive, and other strategies may be associated with uptake of the HPV vaccine which may not have been captured. In future studies, it would be helpful to identify which strategies were most important from the perspective of the study participants, as well as collect information on their knowledge attitudes and beliefs, and how this relates to what strategies were used. Finally, as socioeconomic factors have been shown to have an impact on HPV vaccine uptake in a number of previous studies (Kessels et al., 2012), it would be helpful to provide an analysis of the index of deprivation as described by Pampalon and Raymond (2000) and uptake of the HPV vaccine and whether different strategies were effective in targeting different areas based on the index. The deprivation index includes six socioeconomic indicators grouped along two dimensions, material and social, and has been used as a marker of social inequalities in health (Pampalon & Raymond, 2000; Pampalon et al., 2012). A future analysis using the deprivation index would allow for the identification of inequalities with HPV vaccine coverage, and constitutes a useful tool for

targeting public health planning, intervention and service delivery to improve HPV uptake and other adolescent vaccines.

In considering the findings of this study, it is important to note the large sample included in the analysis. Previous sample size calculations estimated a minimum sample of approximately 400 students (Chapter 3), and data was included on 3291 students. This large sample may have allowed a small effect to be very significant (Loiselle, Profetto-McGrath, Polit & Beck, 2007), however, the findings of the study make sense from a clinical perspective. Efforts to improve the informed consent process through the engagement of schools, parents, and youth is an important role of PHNs in the HPV immunization program, and one for which this study highlights some key strategies as being successful.

Finally, due to the retrospective design of the study, strategies aimed at improving uptake of the HPV vaccine were not randomized to schools, so selection bias may have contributed to the observed effects (Loiselle, Profetto-McGrath, Polit & Beck, 2007; Streiner & Norman, 1995). However, given that nurses have autonomy in choosing which strategies, if any, they implement to improve vaccine uptake, the non-randomized nature of this study reflects the reality of the context in which public health school-based immunization programs are delivered (Cawley et al., 2010; Loiselle, Profetto-McGrath, Polit & Beck, 2007).

Future Implications

Examining the relationship of PHN strategies to improve HPV uptake using a retrospective design has led to a better understanding of the variables that contribute to a successful school-based immunization program. The findings of this study provides

additional evidence to guide practice for PHNs and other health professionals, highlights some key gaps in education for immunizers, provides an opportunity for policy direction to strengthen the HPV immunization program, and lays groundwork for future research to continue to improve uptake of HPV vaccine and other adolescent vaccines.

Implications for practice. The current analysis highlights the critical importance of the role of the PHN in the engagement of parents and school personnel. This study provides new insight into PHN strategies in a successful school-based HPV immunization program, and provides evidence that different approaches may be needed to maximize HPV uptake, including using specific strategies to improve initiation of the vaccine and to improve completion of the vaccine. Extra effort might be made in providing reminder calls to parents for consent return, after a missed clinic, as well as engaging teachers and principals in the HPV immunization program and providing a thank-you for their support in the success of the HPV vaccine uptake. These strategies will help improve the number of students enrolling in the program in future campaigns. Also, considering having a PHN designated as an assigned nurse for a school in which the school-based program is offered, and engaging teachers in the return of students' consents are strategies that all school-based immunization programs may want to employ.

The translation of the evidence to practice will be important for the adoption of the strategies effective in improving HPV vaccine uptake. Publication in peer-reviewed journals and presentation of the findings of this research at conferences and meetings will be important to build the body of evidence on which practice decisions are made, and to reach the target audience.

Implications for education. In 2008, the *Immunization Competencies for Health Professionals* were developed to guide education and training for all immunizers in Canada (PHAC, 2008). The competencies are structured in three key topic areas, including: application of basic biomedical science to immunization, essential immunization practices, and contextual issues in immunization (PHAC, 2008). The current competencies are absent of strategies effective in improving uptake of HPV or other school-based adolescent vaccines. Given the fact that Canada has a successful school-based immunization program that targets adolescent vaccines, including the HPV vaccine, the inclusion of competencies related to strategies effective in improving uptake of adolescent vaccines in a school-based immunization program would help to guide education for health professionals from novice to expert. The inclusion of the strategies found to be effective in this study, as well as other studies, in such a competency-based requirement, will help to strengthen practice and to guide policy development and future research priorities, ultimately improving coverage rates.

Implications for policy. As school-based immunization programs expand to include other adolescent vaccines or eligible groups, i.e., 9-26 year males for HPV vaccine, continued evaluation of public health nursing strategies to enhance uptake of the recommended vaccines while engaging schools, parents, and youth will be needed. The collection of data related to nursing strategies used at time of program delivery could be warranted to ensure reliability of strategies used, and to offer opportunity for future analysis to inform program planning, and allocation of resources.

As the strategies evaluated in this study were not based in a policy framework, the use of each strategy, whether effective or not, was based on the decision of the PHN or

LPN in conjunction with the school. The development of a standardized framework to guide practice in improving HPV uptake through a written policy framework would help to strengthen practice, serving as an education tool for novice nurses, as well as a communication tool with schools in the development of the school nurse–school relationship.

Implications for research. It is clear, in order to maximize uptake in school-based immunization programs, the investigation of the relationship of the factors impacting the uptake of the HPV vaccine and the strategies to address these factors is required. Examining these relationships helps lay the groundwork for future research to continue to improve uptake of HPV vaccine and other adolescent vaccines. Future studies may be designed to offer a comparison of strategies that were found to be “standard practice” in this study, to determine if those strategies are in fact effective in helping to improve uptake, by using a case control study design comparing jurisdictions that do not currently utilize the same strategies with those that do, or by using a randomized controlled trial in newly expanded programs.

Secondly, although PHNs reported engaging males in the HPV immunization program, a separate analysis of the effect of strategies used to target the HPV program with males specifically was not possible. Future studies should explore differences in uptake based on gender, in particular in jurisdictions where the program has been expanded to include males (i.e., Prince Edward Island). Future studies may also include other vaccines in the analysis to highlight differences in vaccines targeted specifically at the female population, i.e. comparing Hepatitis B and HPV vaccine, may also provide the basis of a future gender analysis.

Further, an understanding of the role schools play in the school-based immunization program, from the perspective of school personnel, may provide insight for nurses in engaging with schools in the delivery of school-based immunization programs.

Necessary areas for future research also include exploring PHNs perceptions of support and skills for implementing strategies with schools, parents and youth. Finally, continued studies on the effectiveness of these and other strategies used by nurses in school-based immunization programs is required to guide best practice in public health nursing, and provide information for other health professionals working to help improve uptake of this and other recommended adolescent vaccines.

The findings of the study suggests that a number of strategies to engage parents and schools were effective in helping to improve uptake of the HPV vaccine, and highlights the important role PHNs play in establishing trust in public health programs. This study is, to our knowledge, one of the first studies that explores the relationship between nursing engagement strategies used with schools, parents and youth and levels of uptake of the HPV vaccine in a school-based immunization program, and provides important groundwork for further exploration of the important role of PHNs and their relationship with the schools and communities in a successful school-based HPV immunization program.

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Appendix A

School-Based Immunization Engagement Interview Guide and Questionnaire

You have been invited to take part in a research study looking at strategies and activities used by public health nursing staff in the school-based immunization program to explore if there is a difference in strategies used on the uptake of the HPV vaccine. It is realized that the school-based immunization program is delivered through a collaborative practice model, and as such, it will be helpful for me to consult with those colleagues and staff members who have worked directly with the schools, and would know first-hand what activities or strategies would have been used. This questionnaire will take approximately 30 minutes to complete.

I will first establish some demographic information that will be summarized for the study. I will then review questions to help identify strategies that would have been initiated by you as a PHN/LPN in the 2010-2011 school year to improve the uptake of the HPV vaccine within the comprehensive school-based program for each school for which you were assigned for the program.

A. Demographic Information

Age: ___ 20-30 yrs ___ 31-40 yrs ___ 41-50 yrs ___ > 50 yrs

Nursing Education

___ Diploma leading to LPN	Year graduated: _____
___ Diploma leading to RN	Year graduated: _____
___ Bachelor in Nursing Degree	Year graduated: _____
___ Master in Nursing Degree	Year graduated: _____
___ Other: _____	Year graduated: _____

Employment Status: ___ Full-time ___ Part-time ___ Casual

Total years of nursing experience: ___ Years ___ Months

Total years of public health nursing experience: ___ Years ___ Months

School assignment for 2010-2011:

_____	_____
_____	_____
_____	_____
_____	_____

B. School-based Nursing Strategies for the HPV Immunization Program

School: _____

We are going to review some activities or strategies that have been identified through the literature looking at improving adolescent immunization uptake, particularly in school-based programs. Each activity or strategy may have been described as a practice activity or been shown through empirical evidence to help improve uptake of adolescent vaccines. Some of these activities may have been utilized in the school-based program, whereas others may be new strategies.

Code (0 not used; 1 used)	Strategy description	Who conducted? (PHN, LPN, both)
Usual Practice:		
	HPV immunization consent package distribution by nurse	
	HP V immunization information/presentation provided to students by nurse	
Youth engagement strategies		
	youth participation in health promotion committee or ad hoc committee to promote HPV immunization program and/or cervical cancer prevention (student champion)	
	peer-health promotion in delivery of HPV immunization program, i.e. cervical cancer prevention	
	youth involvement in consent package distribution	
	youth participation in reminder announcements for consent return or clinic dates	
	youth involvement in clinic promotion and/or clinic operations during HPV immunization clinics	
	youth involved in evaluation of HPV immunization and/or cervical cancer prevention	
	pain management best practice used during immunization clinic	
	youth engagement inclusive to male students	
Parent Parent engagement strategies		
	parent participation in health promotion or ad hoc committee to promote HPV immunization program and/or cervical cancer prevention	
	consent package distribution first week of school	
	nurse available to answer questions regarding HPV and HPV immunization	
	parent information session held	
	reminder call for consent return	
	consent package re-sent for non-responders	
	reminder call for missed clinic	

	reminder letter for missed clinic	
	flexible appointments offered, i.e. home visits, catch-up clinics	
School engagement strategies		
	teacher or school personnel participation in health promotion or ad hoc committee to promote HPV immunization program and/or cervical cancer prevention (teacher champion)	
	communication from the schools via newsletters, emails and/or announcements on school websites	
	HPV and HPV vaccine information session held for teachers/school personnel	
	teachers or other school personnel assist with consent package distribution	
	incentives provided to teachers to assist with promotion and/or consent return (i.e. gift card, recognition of contribution, stipend for attendance at after-school workshop)	
	incentives provided to schools to assist with promotion and/or consent return (i.e. pizza parties, grant funding) consents returned to teacher	
	thank-you provided to teacher or school personnel for recognition of contribution	

Additional Questions:

1. Were the strategies discussed above targeted broadly to the school population eligible for the vaccine (grade 7 and grade 8) or were different strategies used by grade level?

2. Were any of the strategies discussed above part of the cervical cancer health promotion campaign that was offered in 2010-2011? If so, was funding received to support cervical cancer health promotion, and how was the funding used?

3. Was there a Public Health Nurse (RN) assigned to this school for the duration of the study period (2010-2011)?

Thank you for your time.

Appendix B

Letter of Invitation to Participate in the Study

Dear Colleague,

As part of my studies at Dalhousie University, I am interested in doing a study about your work. The purpose of the study is to examine the relationship between nursing activities and strategies used to engage schools, parents/guardians and youth in the school-based HPV immunization program and the uptake of the HPV vaccine in the 2010-2011 school year. I am working under the supervision of Dr. Audrey Steenbeek, Associate Professor, Assistant Director Graduate Programs, School of Nursing, Dalhousie University, who is my thesis advisor.

Your participation in this study is essential in understanding public health nursing work in school-based immunization programs and how it impacts uptake of the HPV vaccine. As the school-based immunization program is delivered through a collaborative practice model, it will be helpful for me to consult with those colleagues who have worked directly with the schools, and would know first-hand what activities or strategies would have been used. It may be necessary to meet with a number of individuals together or separately regarding activities and strategies that may have been used in one school. The interview will be a verbal questionnaire aimed to identify strategies used in the school-based immunization program to engage schools, parents and youth based on best-practice strategies and practice descriptions in the literature. Each questionnaire will be coded to link to a school to limit identifying information, and to ensure the linking of strategies to the uptake of the vaccine. All responses will be confidential. Only summary data will be reported.

It is hoped that a interview/questionnaire will be possible for all schools, to allow for comparison of multiple strategies. To be sure there is enough data to detect differences in the strategies used, information on strategies targeting a minimum of 388 students will be the goal. As there were 4312 students eligible in 2010-2011, not all nurses will need to participate in the study. Whether you choose to participate or not will not affect your employment status. Your participation will include completing a verbal questionnaire with the investigator, either face-to face or via telephone. The interview should take approximately 30 minutes.

The results of the completed study will be presented at Public Health and submitted for publication. If you have any questions, please contact me by email at nl776649@dal.ca or by phone at 902-405-2775 or Dr. Steenbeek at ad956837@dal.ca.

Sincerely,

Noella Whelan
Principal Investigator

Appendix C

Consent Form

STUDY TITLE: A Retrospective Review of the School-based Human Papillomavirus (HPV) Immunization Program: Evaluating the effects of Public Health Nursing engagement strategies with schools, parents and youth on HPV vaccine uptake in Greater Halifax

PRINCIPAL OR QUALIFIED INVESTIGATOR Noella W. Whelan, Master of Nursing Student
Dalhousie University, School of Nursing
5869 University Avenue, Halifax, NS B3H 4R2
email: nl776649@dal.ca phone: 405-2775

ASSOCIATE INVESTIGATORS Kimberlee Barro, Site Investigator
Manager, Understanding Communities Unit
Public Health, Capital Health
7 Mellor Avenue, Unit 5
Dartmouth, NS B3B 0E8

1. Introduction

You have been invited to take part in a research study. Taking part in this study is voluntary. It is up to you to decide whether to be in the study or not. Before you decide, you need to understand what the study is for, what risks you might take and what benefits you might receive. This consent form explains the study.

Please read this carefully. Take as much time as you like. If you like, take it home to think about for a while. Mark anything you don't understand, or want explained better. After you have read it, please ask questions about anything that is not clear.

The researchers will:

- Discuss the study with you
- Answer your questions
- Keep confidential any information which could identify you personally
- Be available during the study to deal with problems and answer questions

We do not know if taking part in this study will help you. You may feel better. On the other hand it might not help you at all. It might even make you feel worse. We cannot always predict these things.

If you decide not to take part or if you leave the study early, it will not effect your job or position as a nurse within the organization.

2. Why Is This Study Being Done?

This study will examine any relationship between nursing activities or strategies used in the school-based immunization program, including efforts to engage schools, parents and youth and uptake of the HPV vaccine for the 2010-2011 school-year. To date, few studies have examined nursing activities and strategies to inform best practice to help improve uptake of the HPV vaccine in adolescent girls.

3. Why Am I Being Asked To Join This Study?

As a nurse working in the school-based immunization program, you have first hand knowledge of what activities or strategies would have been used to help us identify what activities or strategies led to a successful immunization campaign in 2010-2011. Your participation in this study may help in understanding public health nursing work in school-based immunization programs and how it impacts uptake of the HPV vaccine. You will have the opportunity through participation in this study, to advance knowledge of nursing practice in relation to the HPV school-based immunization program.

4. How Long Will I Be In The Study?

Your participation will include completing a verbal questionnaire with the investigator, either face-to face or via telephone. The interview should take approximately 30 minutes.

5. How Many People Will Take Part In This Study?

The study is only being done at Capital Health, and will only include nurses working in Public Health directly with the school-based HPV immunization program. It is anticipated that up to 40 nurses (PHNs and LPNs) will be invited to be interviewed, and will include nurses that are members of the Public Health Immunization Team, and PHNs assigned to schools in the community during the 2010-2011 school-year.

To be sure there is enough data to detect differences in the strategies used, information on strategies targeting a minimum of 388 students will be the goal. As there were 4312 students eligible in 2010-2011, not all nurses will need to participate in the study.

6. How Is The Study Being Done?

This study will be a retrospective correlation study design. That means the investigator will look-back at the successful 2010-2011 public health HPV immunization campaign and look for factors that may have contributed to the success of the program that year. Public health data collected during the course of the program will help to identify numbers of students who would have refused vaccination, started the vaccination series (having 1-2 doses), and completed the 3-dose vaccination series. Interviews using a verbal questionnaire will be used to create a list of strategies used by nurses to improve uptake in each of the schools. The information provided by you will be linked by school to determine which strategies, if any had an effect on the uptake of the vaccine.

7. What Will Happen If I Take Part In This Study?

If you want to be part of the study, you will be contacted by the investigator to set up a mutually agreeable time and location for a face-to-face meeting or telephone interview to review the questionnaire. The questionnaire will take about 30 minutes to complete.

As the school-based immunization program is delivered through a collaborative practice model, it will be helpful for the investigator to consult with those nurses who have worked directly with the schools, and would know first-hand what activities or strategies would have been used. It may be necessary to meet with a number of individuals together or separately regarding activities and strategies that may have been used in one school, and will depend on the comfort of the participant. The interview will be a verbal questionnaire aimed to identify strategies used in the school-based immunization program to engage schools, parents and youth based on best-practice strategies and practice descriptions in the literature.

Participation in the study is voluntary and the decision to participate or not participate will not affect your job environment.

8. Are There Risks To The Study?

There are risks with this, or any study. To give you the most complete information available we have listed some *possible* risks. We want to make sure that if you decide to take part in the study, you have had a chance to think about the risks carefully. Please be aware that there may be risks that we don't yet know about.

You may find the interview process or questions posed in the questionnaire uncomfortable. You may not like all of the questions that you will be asked. You may feel uncomfortable responding to questions given the formal position of the researcher. You do not have to answer those questions you find too distressing, and your participation in the study is voluntary. Your decision will not affect your job if you do not participate.

A decision to stop being in the study will not affect any work performance evaluations you may have.

9. What Happens at the End of the Study?

The results of the completed study will be presented at Public Health and submitted for publication. Study participants will have the opportunity to attend the presentation, and to request copies of journal publication from the investigator.

10. What Are My Responsibilities?

As a study participant you will be expected to:

- ▲ Follow the direction of the Principal Investigator

- ⤴ Provide an accurate account of strategies used while working in the school-based immunization program with schools, parents and youth to promote the HPV vaccine in 2010-2011

11. Can I Be Taken Out Of The Study Without My Consent?

Yes. You may be taken out of the study at any time, if:

- ⤴ There is new information that shows that being in this study is not in your best interests.
- ⤴ Capital Health Research Ethics Board or the Principal Investigator decides to stop the study.
- ⤴ You do not follow the directions of the Principal Investigator.

12. What About New Information?

It is possible (but unlikely) that new information may become available while you are in the study that might affect your health, welfare, or willingness to stay in the study. If this happens, you will be informed in a timely manner and will be asked whether you wish to continue taking part in the study or not.

13. Will It Cost Me Anything?

There are no anticipated costs to participate in the study.

Compensation

You will not be paid to be in the study.

Research Related Injury

If you become ill or injured as a direct result of participating in this study, necessary medical treatment will be available at no additional cost to you. Your signature on this form only indicates that you have understood to your satisfaction the information regarding your participation in the study and agree to participate as a subject. In no way does this waive your legal rights nor release the Principal Investigator, the research staff, the study sponsor or involved institutions from their legal and professional responsibilities.

14. What About My Right to Privacy?

Protecting your privacy is an important part of this study. A copy of this consent will be put in the study records.

When you sign this consent form you give us permission to:

- ⤴ Collect information from you
- ⤴ Share information with the people conducting the study

Access to records

The members of the research team will see study records that identify you by name.

Other people may need to look at the study records that identify you by name. These might include:

- ▲ the CDHA Research Ethics Board and Research Quality Associate

Use of records.

The research team will collect and use only the information they need to complete the Study. This information will only be used for the purposes of this study.

This information will include your:

- age
- sex
- level of educational
- employment status
- years experience
- school assignment for the 2010-2011 school year
- information from study interviews and questionnaires

Your name and contact information will be kept secure by the research team at Public Health. It will not be shared with others without your permission. Your name will not appear in any report or article published as a result of this study. Information collected for this study will kept as long as required by law. This could be 7 years or more.

If you decide to withdraw from the study, the information collected up to that time will continue to be used by the research team, unless specifically requested.

After your part in this study ends, we may continue to review the information you have provided and check that the information we collected is correct.

Information collected and used by the research team will be stored by the Public Health Understanding Communities Unit (UCU), Capital Health. The Manager of the UCU Patient, Kim Barro, is the person responsible for keeping it secure.

You may also be contacted personally by Research Auditors for quality assurance purposes.

Your access to records

You may ask the study investigator to see the information that has been collected about you.

15. WHAT IF I WANT TO QUIT THE STUDY?

If you chose to participate and later change your mind, you can say no and stop the research at any time. If you wish to withdraw your consent please inform the Principal

Investigator. All data collected up to the date you withdraw your consent will remain in the study records, to be included in study related analyses. A decision to stop being in the study will not affect any work performance evaluations you may have.

16. Declaration Of Financial Interest

The Principal Investigator has no financial interests in conducting this research study.

17. What About Questions Or Problems?

For further information about the study contact Noella Whelan, who is in charge of this study at this institution (he/she is the “Principal Investigator”). Ms. Whelan email is nl776649@dal.ca and telephone number is (902) 405-2775. If you can’t reach the Principal Investigator, please refer to the attached Research Team Contact Page for a full list of the people you can contact for further information about the study.

The Principal Investigator is **Ms. Noella Whelan**.
Telephone: (902) 405-2775

19. What Are My Rights?

After you have signed this consent form you will be given a copy.
If you have any questions about your rights as a research participant, contact the **Patient Representative** at **(902) 473-2133**.

In the next part you will be asked if you agree (consent) to join this study. If the answer is “yes”, you will need to sign the form.

20. Consent Form Signature Page

I have reviewed all of the information in this consent form related to the study called:

A Retrospective Review of the School-based Human Papillomavirus (HPV) Immunization Program: Evaluating the effects of Public Health Nursing engagement strategies with schools, parents and youth on HPV vaccine uptake in Greater Halifax

I have been given the opportunity to discuss this study. All of my questions have been answered to my satisfaction.

This signature on this consent form means that I agree to take part in this study. I understand that I am free to withdraw at any time.

_____	_____	____ / ____ / ____
Signature of Participant	Name (Printed)	Year Month Day*

_____	_____	____ / ____ / ____
Witness to Participant's Signature	Name (Printed)	Year Month Day*

_____	_____	____ / ____ / ____
Signature of Investigator	Name (Printed)	Year Month Day*

_____	_____	____ / ____ / ____
Signature of Person Conducting Consent Discussion	Name (Printed)	Year Month Day*

****Note: Please fill in the dates personally***

I Will Be Given A Signed Copy Of This Consent Form

Thank you for your time and patience!

Appendix D

Variables Included in Study

Nursing Engagement Strategies and HPV Vaccine Uptake

Variable Category	Variable Description	Coding for Data Analysis	Source
Youth Demographic	Age	Age in Years	CH HPV Data Set ^a
	Biological Sex	Female = 1 Male = 0	CH HPV Data Set
	School Type ^b	Private = 1 Public = 0	CH HPV Data Set
	School Location	Rural = 1 Urban = 0	CH HPV Data Set
	CHB	Name of CHB	CH HPV Data Set
Nurse Demographic	Age	Age in Years	Study Questionnaire
	Highest Nursing Education	Master of Nursing = 4 Bachelor of Nursing = 3 Post-RN PHN Program ^c = 2 RN Diploma = 1 Post-LPN Immunization Certificate ^d = 0	Study Questionnaire
	Employment Status	Casual = 2 Part-time = 1 Fulltime = 0	Study Questionnaire
	Nursing Experience	Years	Study Questionnaire
	Public Health Nursing Experience	Years	Study Questionnaire
	School Assignment	Number of Schools (count)	Study Questionnaire
	Youth Engagement	HPV immunization consent package distribution by nurse (x1)	Strategy Used = 1 Strategy Not Used = 0
HPV immunization information/presentation provided to students by nurse (x2)		Strategy Used = 1 Strategy Not Used = 0	Study Questionnaire
Youth participation in health promotion committee or ad hoc committee to promote HPV immunization program and/or cervical cancer prevention (x3)		Strategy Used = 1 Strategy Not Used = 0	Study Questionnaire
Peer-health promotion in delivery of HPV		Strategy Used = 1 Strategy Not Used = 0	Study Questionnaire

Variable Category	Variable Description	Coding for Data Analysis	Source
	immunization program, i.e. cervical cancer prevention (x4)		
	Youth involvement in consent package distribution (x5)	Strategy Used = 1 Strategy Not Used = 0	Study Questionnaire
	Youth participation in reminder announcements for consent return or clinic dates (x6)	Strategy Used = 1 Strategy Not Used = 0	Study Questionnaire
	Youth involvement in clinic promotion and/or clinic operations during HPV immunization clinics (x7)	Strategy Used = 1 Strategy Not Used = 0	Study Questionnaire
	Youth involved in evaluation of HPV immunization and/or cervical cancer prevention (x8)	Strategy Used = 1 Strategy Not Used = 0	Study Questionnaire
	Pain management best practice used during immunization clinic (x9)	Strategy Used = 1 Strategy Not Used = 0	Study Questionnaire
	Youth engagement inclusive to male students (x10)	Strategy Used = 1 Strategy Not Used = 0	Study Questionnaire
Parent Engagement	Parent participation in health promotion or ad hoc committee to promote HPV immunization program and/or cervical cancer prevention (x11)	Strategy Used = 1 Strategy Not Used = 0	Study Questionnaire
	Consent package distribution first week of school (x12)	Strategy Used = 1 Strategy Not Used = 0	Study Questionnaire
	Nurse available to answer questions regarding HPV and HPV immunization (x13)	Strategy Used = 1 Strategy Not Used = 0	Study Questionnaire
	Parent information session held (x14)	Strategy Used = 1 Strategy Not Used = 0	Study Questionnaire
	Reminder call for consent return (x15)	Strategy Used = 1 Strategy Not Used = 0	Study Questionnaire
	Consent package re-sent for non-responders (x16)	Strategy Used = 1 Strategy Not Used = 0	Study Questionnaire
	Reminder call for missed	Strategy Used = 1	Study Questionnaire

Variable Category	Variable Description	Coding for Data Analysis	Source
	clinic (x17)	Strategy Not Used = 0	
	Reminder letter for missed clinic (x18)	Strategy Used = 1 Strategy Not Used = 0	Study Questionnaire
	Flexible appointments offered, i.e. home visits, catch-up clinics (x19)	Strategy Used = 1 Strategy Not Used = 0	Study Questionnaire
School Engagement	Teacher or school personnel participation in health promotion or ad hoc committee to promote HPV immunization program and/or cervical cancer prevention (x20)	Strategy Used = 1 Strategy Not Used = 0	Study Questionnaire
	Communication from the schools via newsletters, emails and/or announcements on school websites (x21)	Strategy Used = 1 Strategy Not Used = 0	Study Questionnaire
	HPV and HPV vaccine information session held for teachers/school personnel (x22)	Strategy Used = 1 Strategy Not Used = 0	Study Questionnaire
	Teachers or other school personnel assist with consent package distribution (x23)	Strategy Used = 1 Strategy Not Used = 0	Study Questionnaire
	Incentives provided to teachers to assist with promotion and/or consent return (i.e. gift card, recognition of contribution, stipend for attendance at after-school workshop) (x24)	Strategy Used = 1 Strategy Not Used = 0	Study Questionnaire
	Incentives provided to schools to assist with promotion and/or consent return (i.e. pizza parties, grant funding) (x25)	Strategy Used = 1 Strategy Not Used = 0	Study Questionnaire
	Consents returned to teacher (x26)	Strategy Used = 1 Strategy Not Used = 0	Study Questionnaire
	Thank-you provided to teacher or school personnel for recognition of contribution (x27)	Strategy Used = 1 Strategy Not Used = 0	Study Questionnaire
	Strategies targeting grade 7 and grade 8 (x28)	Different Strategies Used = 1 Same Strategies Used = 0	Study Questionnaire

Variable Category	Variable Description	Coding for Data Analysis	Source
	Participation in Cervical Cancer Health Promotion Program (x29)	Participated = 1 Did not Participate = 0	Study Questionnaire
	Funding Received for Cervical Cancer Health Promotion Campaign (x30)	Funding Received = 1 No Funding Received = 0	Study Questionnaire
	PHN Assigned to School (x31)	Yes = 1 No = 0	Study Questionnaire
Outcome Variable	HPV uptake	Completion (3 doses) = 2 Initiation (1-2 doses) = 1 Refusal (0 doses) = 0	CH HPV Data Set

Note. CH = Capital Health, CHB = Community Health Board, HPV = Human Papillomavirus,

^aCH HPV Data Set = Capital Health HPV School-based Immunization Data Set

^bComparison of English and French Language Schools was not completed so as to not identify participants in the study.

^cPost-RN PHN Program is a 1 or 2 year post-RN program that focuses specifically on competencies required for public health nursing.

^dPost-LPN Immunization Certificate is a 60-hour post-graduate diploma for licensed practical nurses at the Nova Scotia Community College which provides competency training specific to immunization practice.

Appendix E

Copyright Release

June 10, 2013

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I am preparing my Master of Nursing (MN) thesis for submission to the Faculty of Graduate Studies at Dalhousie University, Halifax, Nova Scotia, Canada. I am seeking your permission to include Figure 1. The Vaccine Perceptions, Accountability, and Adherence Model of the following paper(s) as the basis for my theoretical framework, and to adapt the model based on the results of the study in the thesis:
Scaling up human papillomavirus vaccination: a conceptual framework of vaccine adherence. Katz IT, Ware NC, Gray G, Haberer JE, Mellins CA, Bangsberg DR. *Sexual Health*, 7:279-286, 2010.
<http://dx.doi.org/10.1071/SH09130>

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Full publication details and a copy of this permission letter will be included in the thesis.


Yours sincerely,

Noella Whelan BN RN
Master of Nursing Student, Dalhousie University

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Date: Tue, 18 Jun 2013 04:22:25 +0000 [06/18/13 1:22:25 AM ADT]
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To: NL776649@dal.ca
Subject: RE: Copyright Release Request-Our Ref: CP2013-091
Part(s):  2 [Whelan_Copyright Release Request_June 10, 2013.pdf](#) 108 KB 

Dear Ms Whelan,

Yes, you have reached the correct address. Please note that we are currently dealing with a huge volume of permission request and your request has been put in the queue.

I have now looked at your letter and checked the image that you are seeking permission for. I am pleased to confirm that you have our permission for Figure 1 from Ingrid T Katz et al.'s article, published in *Sexual Health* 7(3): 279-286 <http://dx.doi.org/10.1071/SH09130>, to be used in your Master in Nursing (MN) thesis in the manner as described in your letter (attached).

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Best wishes,

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Towards a Sustainable Future - do you really need to print this?

-----Original Message-----

From: Noella Whelan [<mailto:NL776649@DAL.CA>]

Sent: Tuesday, 18 June 2013 1:09 PM

To: Noella Whelan

Cc: PUBLISHING - General Info

Subject: Re: Copyright Release Request

Hi there,

I am just writing to follow-up on the request noted in the email below. Can you please let me know if I have contacted the correct agency/email.

Thanks in advance,

Noella

Noella Whelan BN RN
Master of Nursing Student
Dalhousie University
Halifax, Canada
Tel: 902-405-2775
Email: n1776649@dal.ca

Quoting Noella Whelan <NL776649@DAL.CA>:

> Hi there,

>

> Please consider my request for copyright release as described in the
> attached letter.

>

> Sincerely,

>

> Noella Whelan BN RN
> Master of Nursing Student, Dalhousie University
> Halifax, NS, Canada

>

> Tel 902-405-2775

> Email n1776649@dal.ca