

SCHOOL NURSES' ROLE AS OPINION LEADERS REGARDING THE HPV
VACCINE FOR YOUTH

A Dissertation

by

BRITTANY LEIGH ROSEN

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Chair of Committee,	Patricia Goodson
Committee Members,	Bruce Thompson
	B.E. Pruitt
	E. Lisako J. McKyer
	Kelly L. Wilson
Head of Department,	Richard Kreider

August 2013

Major Subject: Health Education

Copyright 2013 Brittany Leigh Rosen

ABSTRACT

The most common sexually transmitted infection for both males and females is the human papillomavirus (HPV). HPV is responsible for nearly all cervical cancers. Currently, an HPV vaccine is available; however, HPV vaccination rates for US adolescents are dismal.

School nurses serve as the person connecting medical and school communities, and are a critical component in assisting families traverse the medical and educational systems. Thus, there is reason to assume school nurses can be key opinion leaders regarding the HPV vaccine.

The purpose of this study was to: (1) explain how the Diffusion of Innovations (DOI) theory explains school nurses' roles as opinion leaders regarding the HPV vaccine; (2) document current literature regarding healthcare providers' perspectives and practice regarding the HPV vaccine; and (3) evaluate school nurses' knowledge, attitudes, perceptions of being an opinion leader and professional practice regarding the HPV vaccine for youth.

DOI states opinion leaders influence the rate of an innovation (e.g., the HPV vaccine). We argue school nurses are opinion leaders for the HPV vaccine because of their unique leadership position through their cross-disciplinary understanding of the educational and health systems.

The systematic literature review included 28 studies of healthcare providers. The main barrier, vaccine cost, was identified in 12 reports. Additionally, females and older adolescents were more frequently vaccinated than males and younger adolescents.

To examine school nurses' knowledge, attitudes, perceptions and professional practice regarding the HPV vaccine, the study included a sample of 413 school nurses. Structural equation modeling revealed knowledge influenced attitudes, attitudes affected perceptions and professional practices, and perceptions predicted professional practice. Furthermore, the perceptions variable was found to be a partial mediator in the model.

Practitioners designing programs to engage school nurses in disseminating HPV vaccine education may benefit from questioning whether their programs might be emphasizing non-crucial elements for influencing vaccine dissemination practice (e.g., knowledge) and de-emphasizing influential elements such as attitudes and perceptions.

DEDICATION

This dissertation is dedicated to my family. Mom and Dad, *THANK YOU* so much for everything you have provided over my entire academic career, from the financial support to the mental and emotional support. *Thank you* for listening to my emotional *freak-outs* and still believing in my ability to finish anything I start. I am blessed to have so much love, support, encouragements, and guidance from both of you. I know that I would not have been able to accomplish as much as I have without both of your support and encouragement.

To my brother, Nolan, thank you for all the support and interest in my success. While most siblings have rivalries, you have always encouraged me to strive for more and accomplish what I believed was beyond my ability. Your encouragement and friendship has contributed so much to my success and I thank you for that. I would also like to thank you for always helping me relieve stress from school when I would come home on all those weekends and holidays.

I would like to thank my extended family, Courtney, Ross, Evan, Kelsey, Lynn, and Rod for taking an interest in my endeavors. Moreover, thank you Fergus, for being the best lap cat and always willing to sit with me while I wrote my dissertation!

To my partner, Tyler, thank you for allowing me to chase my dreams. Thank you for your understanding and patience through the writing during late nights, weekends, and holidays. Your support and encouragement allowed me to find strength and energy when I did not want to continue. Thank you for your love, support, and encouragement!

ACKNOWLEDGEMENTS

I would like to thank my chair, Dr. Patricia Goodson, and my committee members, Dr. Bruce Thompson, Dr. Buzz Pruitt, Dr. Lisako McKyer, and Dr. Kelly Wilson for the support, guidance, and encouragement during my course work and through the dissertation process.

To Dr. Patricia Goodson, I cannot express the gratitude I have for you in taking me on as your student. You have taught me to be a writer, researcher, —and most importantly—a thinker! You are truly a wonderful mentor that has every student's best interest in mind and genuinely care about your student's work. I could not have asked for a better mentor. I cannot *thank you* enough for helping me develop into a professional and providing me with the abilities and skills I need to start my career.

Dr. Kelly Wilson, I owe so much of my accomplishments and successes to you! First, I would not be where I am today if you had not provided me with advice, guidance and support as an undergraduate and graduate student at Texas State. You have taught me how to be a presenter, teacher, health educator, and active professional—to name just a few. Thank you for all the opportunities you have provided and believing in my abilities. I am grateful for our talks and for you helping me plan my (personal and professional) life! I look forward to working with you for many years to come.

Many thanks to Bilgin Navruz for assisting me with my statistics and allowing me to use your time and computer to run my stats, Margaret Foster for her time and support with the systematic literature review, and Jennifer Blaase for assisting in the data

collection needed to complete this dissertation. Thanks to Ledric Sherman for swapping dissertations with me and providing me with much needed feedback, friendship, and dinners at Casa Rod!

I would also like to thank Dr. Elisa Beth McNeill for putting up with me during my *stressed* times. I am very grateful for all your support and believing that I could actually finish. Thank you for allowing me to work for you and showing me how to be a presenter, teacher, and providing me with the knowledge that it is acceptable to let my personality show while teaching!

To those who have helped me keep my sanity during my time here at Texas A&M. Dr. Andrea DeMaria, I would not have survived my first year as a doctoral student if I did not have your advice, support, and friendship. Sara Fehr, thank you for our three-hour conversations, visits to College Station, and encouragement through this process. I would have lost my mind if I had not had your friendship and support. See you in Cincinnati soon!

Chapter IV of this dissertation was funded by American School Health Association (ASHA), The Sydney & J.L. Huffines Institute for Sports Medicine & Human Performance at Texas A&M University, and the College of Education and Development at Texas A&M University. I would also like to acknowledge the National Association of School Nurses (NASN) membership as the data source of Chapter IV.

TABLE OF CONTENTS

	Page
ABSTRACT	ii
DEDICATION	iv
ACKNOWLEDGEMENTS	v
TABLE OF CONTENTS	vii
LIST OF FIGURES	ix
LIST OF TABLES	x
CHAPTER I INTRODUCTION	1
CHAPTER II A RECOMMENDATION TO USE THE DIFFUSION OF INNOVATIONS THEORY TO UNDERSTAND SCHOOL NURSES' ROLE IN HPV VACCINE UPTAKE.....	7
Introduction	7
Theoretical Review	9
Implications for School Health	19
CHAPTER III HEALTHCARE PROVIDERS AND THE HPV VACCINE: A SYSTEMATIC REVIEW	24
Introduction	24
Methods	27
Findings	28
Discussion	65
CHAPTER IV SCHOOL NURSES' KNOWLEDGE, ATTITUDES, PERCEPTIONS, AND PROFESSIONAL PRACTICE REGARDING HPV VACCINE FOR YOUTH.....	72
Introduction	72
Methods	76
Results	83
Discussion	100
CHAPTER V CONCLUSIONS	107

REFERENCES	111
APPENDIX A SURVEY INSTRUMENT	131
APPENDIX B TABLE OF KNOWLEDGE INDEX SCORES	148
APPENDIX C TABLE OF ATTITUDE SCALE SCORES	149
APPENDIX D TABLE OF PERCEPTIONS SCALE SCORES	150
APPENDIX E TABLE OF PROFESSIONAL PRACTICE SCALE SCORES	151

LIST OF FIGURES

	Page
Figure 3.1 Flowchart of articles reviewed for inclusion in sytematic review	29
Figure 4.1 Proposed model for the relationships among school nurses' knowledge, attitudes, perceptions of their role as opinion leaders, and professional practice regarding HPV vaccine for youth in the US.....	76
Figure 4.2 Proposed model for school nurses' knowledge, attitudes, perceptions of role as opinion leader impact of professional practice regarding HPV vaccine for youth with standardized regression weights.....	96
Figure 4.3 Modified model for school nurses' knowledge, attitudes, perceptions of role as opinion leader impact of professional practice regarding HPV vaccine for youth with knowledge paths removed from perceptions and practice and standardized regression weight	98
Figure 4.4 Modified model for school nurses' knowledge, attitudes, and professional practice regarding HPV vaccine for youth with standardized regression weights	99

LIST OF TABLES

	Page
Table 3.1 Matrix of the 28 Study Characteristics.....	31
Table 3.2 Percentage of the 28 Study's Topics.....	35
Table 3.3 Summary of Findings for the 28 Studies.....	42
Table 4.1 Item Specifications for Knowledge Index.....	79
Table 4.2 Study Participant Characteristics on Continuous Variables (n = 413).....	84
Table 4.3 Study Participant Characteristics on Non-Continuous Variables (n = 413) ...	85
Table 4.4 ANOVA Results for Knowledge, Attitudes, Perceptions, and Professional Practice by Geographic Population.....	90
Table 4.5 ANOVA Results for Knowledge, Attitudes, Perceptions, and Professional Practice by Grade Level Currently Serving.....	91
Table 4.6 ANOVA Results for Knowledge, Attitudes, Perceptions, and Professional Practice by Race/Ethnicity	92
Table 4.7 Pearson's <i>r</i> Correlation for Knowledge, Attitudes, Perceptions, and Professional Practice by Years Working in a School Environment	93
Table 4.8 Scale Scores and Reliability Statistic	94

CHAPTER I

INTRODUCTION

The most common sexually transmitted infection (STI) in the United States (US) in terms of prevalence and incidence rates for both males and females is caused by the human papillomavirus (HPV; Dunne et al., 2007; Giuliano et al., 2011; Weinstock, Berman, & Cates, 2004). The various types of HPV can be classified into two categories: (a) low risk—causing genital warts—and (b) high risk—causing cervical cancer (Ehrhardt, 2007). HPV is responsible for nearly all cervical cancers (Centers for Disease Control and Prevention [CDC], 2011a), which cause over 4,000 deaths in the US each year (American Cancer Society, 2011). HPV is also linked with 65% of vaginal cancers, 50% of vulvar cancers, 35% of penile cancers and 90% of anal cancers (CDC, 2011a). Other less common illnesses associated with HPV include head and neck cancers (CDC, 2009). When counted in tandem, 6,800 deaths in the US are linked to HPV annually (National Cancer Institute, 2012).

Currently, however, an HPV vaccine is available, and it has been shown to protect against most genital warts (in males and females), anal cancer (in males and females), and vaginal and vulvar cancers (CDC, 2011b). The HPV vaccine is nearly 100% effective in preventing precancerous cervical, vaginal, and vulvar lesions and genital warts caused by the HPV types (6, 11, 16, and 18) against which the vaccine is directed (US Food and Drug Administration, 2010). For the vaccine to be effective, the

patient must receive three doses—over a six month period—and preferably before becoming sexually active (CDC, 2013d).

Since the HPV vaccine was approved in the US during 2006 (for females) and 2009 (for males), 53% of US female teens (13-17 years) have been vaccinated with the *first* of the three required doses. Furthermore, 34.8% of US adolescent females have received *all three* recommended doses (CDC, 2012a). In 2011, US male teens' HPV vaccination rates were estimated to be 8.3% with the *first* of three required doses (CDC, 2012a). These rates are far from the *Healthy People 2020* objective of 80% coverage for females 13-15 years and no percentage targeted for males (US Department of Health and Human Services, 2012).

Low HPV vaccination acceptance factors include lack of appropriate and adequate information about the HPV vaccine from healthcare professionals (Nagaraj, 2006; Serpell & Green, 2006), parents' belief the HPV vaccine would promote promiscuity, parents' and children's concerns about vaccine safety and possible side effects (allergic reactions, fever, headache, or fainting; CDC, 2012b; Mathur, Mathur, & Reichling, 2010), and trust in authorities recommending the vaccine (Kimmel, 2006). These low HPV vaccination rates indicate a divide between the availability of a vaccine and its acceptance and uptake by youth.

Wide-spread acceptance of the HPV vaccine relies on various stakeholders: the adolescents, their parents, and healthcare providers. In a recent study, adolescents rated parents, doctors, or nurses as their most important source of HPV vaccine information (Mathur et al., 2010). Studies are also finding that, when assessing parents' role in HPV

vaccine acceptance, parents are more likely to vaccinate their child if the parent believes his/her doctor would recommend the child receive the HPV vaccine (Boehner, Howe, Bernstein, & Rosenthal, 2003; Davis, Dickman, Ferris, & Dias, 2004; Dempsey, Zimet, Davis, & Koutsky, 2006; Gerend, Lee, & Shepherd, 2006; Kahn et al., 2003; Kahn, Rosenthal, Hamann, & Bernstein, 2003; Olshen, Woods, Austin, Luskin, & Bauchner, 2005). Other factors influencing parents' HPV vaccination acceptance include being influenced by peer groups, parent perceiving the child is susceptible to HPV infection, and having had personal experience with genital warts (Dempsey et al., 2006). Lastly, a literature review focusing on physicians and the HPV vaccine showed that while most physicians were *knowledgeable* about HPV infections (Bartlett & Peterson, 2011), the reasons they did *not recommend* the vaccine included prior experience with parent refusal for younger child and the amount of time needed to discuss vaccine with parents. Physicians also perceived parents' rationale for refusing the vaccine to include unknown long-term side effects and absence of sexual activity by daughters (Bartlett & Peterson, 2011).

Given the various stakeholders and their equally varied reasons for accepting or rejecting the HPV vaccine, campaigns to increase vaccination rates may be more successful if they include an endorsement of HPV vaccination by trusted individuals and promotion of the vaccination as a social norm (Conroy et al., 2009). Because they are perceived as trustworthy, have professional knowledge, interact daily with school-aged youth, and exert leadership roles in the communities they serve, school nurses represent

invaluable stakeholders in disseminating information about and the uptake of the HPV vaccine among youth.

School nurses serve as the person connecting the medical and school communities, and therefore, are a critical component in assisting parents and students attempting to traverse the medical and educational systems (American Academy of Pediatrics Council on School Health, 2008). The literature indicates students and school communities are healthier if they employ school nurses (Baisch, Lundeen, & Murphy, 2011; Canham et al., 2007; DeSocio & Hootman, 2004; Ethan & Basch, 2008; Farris, McCarthy, Kelly, Clay, & Gross, 2003; Ficca & Welk, 2006; Gutt, Engelke, & Swanson, 2004; Johnson & Hayes, 2006; Moonie, Sterling, Figgs, & Castro, 2008). For schools that do employ a nurse, he/she acts as the onsite healthcare provider (American Academy of Pediatrics Council on School Health, 2008), especially for students who do not have consistent access to healthcare. Additionally, there is evidence supporting schools with nurses have higher vaccination rates for other recommended vaccines (American Academy of Pediatrics Council on School Health, 2008). Thus, there is reason to assume school nurses can be key opinion leaders regarding the promotion of HPV vaccination for youth.

Due to their salient roles, as well as their linking of the medical and school communities, there is a need to understand school nurses as opinion leaders regarding the HPV vaccination rates in youth. However, while school nurses are the most readily available healthcare professional to families with adolescents (Bennett, 2008), no study

has yet explored school nurses' role in increasing HPV vaccination rates and educating parents and students about the HPV vaccine's benefits.

The purpose of this dissertation is to provide empirical evidence of US school nurses' knowledge, attitudes, professional practice, and perceptions of role as opinion leader regarding the HPV vaccine for youth. More specifically, this dissertation will: (1) Discuss the theory utilized to guide this research project and how the theory explains school nurses' role as opinion leaders regarding the HPV vaccine for youth; (2) Document and assess current literature regarding healthcare providers' knowledge, attitudes, perceptions, intentions, and professional practice regarding the HPV vaccine for youth; and (3) Provide results from a quantitative online survey measuring school nurses' knowledge, attitudes, professional practice, and perceptions of role as opinion leader regarding HPV vaccine for youth. This innovative study will provide in-depth information about school nurses' knowledge, attitudes, perceptions and professional practice regarding HPV vaccine for youth, which, can be used to develop and implement appropriate vaccination campaigns for youth in the US.

This dissertation is comprised of five chapters. Chapters II-IV represent manuscripts that will be submitted to peer-reviewed journals for publication. The following is a description of each chapter:

- Chapter I provides an overview of the topic being examined throughout this document. Additionally, the purpose, significance, and innovation of the research project are outlined.

- Chapter II presents the Diffusion of Innovations theory (DOI) being utilized to guide this research project. This chapter also focuses on examining school nurses as opinion leaders within the DOI and how DOI is a useful theory to assess school nurses' role in promoting the HPV vaccine for youth. This chapter represents the first journal article.
- Chapter III documents the current literature regarding healthcare providers' knowledge, attitudes, perceptions, intentions, and professional practice regarding the HPV vaccine for youth. This review of the literature follows a systematic literature review framework (Garrard, 2010). In addition, this chapter documents the gap in research assessing school nurses' knowledge, attitudes, and professional practice regarding the HPV vaccine for youth. This chapter represents the second journal article.
- Chapter IV reports on quantitative findings from an online survey distributed to members of the National Association of School Nurses. The report examines a sample of 413 school nurses' knowledge, attitudes, and professional practice regarding the HPV vaccine for youth. Findings identifying school nurses' perceptions of their role as opinion leaders regarding the HPV vaccine for youth are provided. This chapter represents the third journal article.
- Chapter V presents the conclusions reached by examining the theory and evidence found in chapters II-IV. Implications for health education, school health, and school nursing fields are discussed, and recommendations for future research are provided.

CHAPTER II

A RECOMMENDATION TO USE THE DIFFUSION OF INNOVATIONS THEORY TO UNDERSTAND SCHOOL NURSES' ROLE IN HPV VACCINE UPTAKE

Introduction

Diffusion theory does not lead to the conclusion that one must wait for the diffusion of a new product or practice to reach [specific population groups]

In fact, one can accelerate the rate of adoption in any segment of the population through more intensive and more appropriate communication and outreach.

(Green, Gottlieb, & Parcel, 1991, p. 114)

Medical prevention is considered more economical than treatment (Rogers, 2002), and this is true for vaccinations. In 1999, the Centers for Disease Control and Prevention (CDC) named vaccinations as one of the century's greatest public health achievements (CDC, 1999). Nearly 14 years later, in 2013, CDC released an updated immunization schedule for adults, infants/children, and adolescents (CDC, 2013d).

While adolescents receive most required or recommended vaccines, the Human Papillomavirus (HPV) vaccination rates remain low among US teenagers (CDC, 2012a). Since its approval in 2006 (for females) and 2009 (for males), 53% of female teens have been vaccinated with the *first* of the three required doses. Furthermore, only 34.8% of adolescent females have received *all three* recommended doses. Males three dose vaccination rates are currently not reported (CDC, 2012a).

The HPV vaccine helps protect against certain sexually transmitted infections and cancers. Two vaccines (Cervarix and Gardasil) protect females against HPV strains causing most cervical cancer cases (CDC, 2013c). Gardasil also protects against most genital warts (in males and females), anal cancer (in males and females), and vaginal and vulvar cancers. However, the vaccine provides the greatest benefit only when all three doses are received before the person becomes sexually active (CDC, 2013c). If the HPV vaccine confers health benefits, but HPV vaccination rates remain low, how can we, as health educators, more effectively diffuse and implement support for the HPV vaccine and, ultimately, increase the HPV vaccination rates among youth?

Although the solution to this vaccine uptake problem is complex, non-linear, and multifaceted (Roux, 2011), one component includes identifying and examining how HPV vaccination behaviors may spread through populations. Specifically, examining how opinion leaders influence the vaccine's diffusion may be a helpful first step.

While much of the US health promotion literature has examined physicians, pediatricians, and other healthcare providers' knowledge, attitudes, intentions, and professional practice regarding the HPV vaccine, none has empirically explored US school nurses' role in helping educate the school community about the HPV vaccination benefits. To date, it appears researchers and practitioners have failed to include *all* opinion leaders in the study of the HPV vaccine diffusion process (see Chapter III).

While US school nurses have been conspicuously absent from health promotion research, recent studies in the United Kingdom and Sweden have examined school nurses' perceptions and experiences of implementing a government-mandated HPV

vaccination program. Those studies have shown that non-US school nurses' perceptions or experiences included positive attitudes regarding the HPV vaccine as a preventive health measure (Boyce & Holmes, 2012; Gottvall, Tyden, Larsson, Stenhammar, & Hoglund, 2011; Hilton, Hunt, Bedford, & Petticrew, 2011), concerns about fitting the immunization tasks into their already demanding schedules (Boyce & Holmes, 2012; Gottvall et al., 2011; Hilton et al., 2011), and insecurity about their knowledge of the HPV vaccine (Gottvall et al., 2011).

To examine the potentially positive role school nurses might play in disseminating knowledge and promoting vaccination behavior among US teenagers, we propose adopting the Diffusion of Innovations theory (DOI) as a framework. Thus, this article's purpose is to identify how the DOI theory can help us understand school nurses' HPV vaccine knowledge, attitudes, perceptions of role as opinion leader, and professional practice, which in turn can help increase youths' HPV vaccination rates. As Rogers—the main theorist behind DOI—reminds us, “The success or failure of diffusion programs rests in part on the role of opinion leaders” (Rogers, 2003, p. 99).

Theoretical Review

Researchers in multiple disciplines have utilized the DOI theory for almost a century, focusing on topics ranging from agricultural techniques to birth control, and public education to health education programs (Ferrence, 2001). This theory is unique as it describes the process of change at many levels over time, while incorporating other theories such as Social Cognitive Theory and Communications Theory, to offer a better understanding of the diffusion phenomenon (Ferrence, 2001).

The DOI theory, as developed and refined by Everett M. Rogers, owes its beginnings to studies carried out by Gabriel Tarde. According to Rogers, Tarde “was a Frenchman lawyer and judge around 1900 who kept an analytical eye on trends in his society as presented by the legal cases that came before his court” (Rogers, 2003, p. 14). Tarde wanted to understand the reasons why some innovations spread and others were forgotten. He noticed an innovation's adoption rate followed an S-shaped curve over time, and the adoption takeoff started with opinion leaders using the innovation (Rogers, 2003). Tarde’s theory characterizes social imitation as an epidemic (Ferrence, 2001), and an idea, much like a virus, spreading from one person to another through contagion (Gladwell, 2002).

To understand the role opinion leaders play in the process of spreading a new idea or a new practice—in our case, examining school nurses' roles in HPV vaccination rates—we need to understand the diffusion process itself. Diffusion of information or innovations is a process “by which (1) an *innovation* (2) is *communicated* through certain *channels* (3) *over time* (4) among the members of a *social system*” (Rogers, 2003, p. 11). Opinion leaders are members within a *social system* that *communicate* with and influence other members about the *innovation* over a certain *time* period. As Rogers (2003, p. 11) claims, “These elements are identifiable in every diffusion research study and in every diffusion campaign or program.” To understand opinion leaders’ role in the diffusion process, it is important to examine the theory’s constructs of innovation, communication channels, social systems, and time.

Innovation

Innovation is the first component in the DOI theory and Rogers (2003) defines *innovation* as an idea, practice, or object an individual perceives as new. The “newness” of the innovation is *not* based on lapse of time from when the person discovers the innovation. Rather, if the idea appears new to the individual it is considered an innovation. If the idea is perceived as new, this perception will determine the individual’s reaction to the idea. Therefore, the “newness” is not restricted to the individual’s new knowledge of this innovation. Someone may have prior knowledge about the innovation, but he/she may not yet have developed an attitude—whether favorable or unfavorable—toward the innovation. An innovation’s “newness” may not only be represented based on knowledge, but also in terms of the attitude or decision to use that innovation (Rogers, 2003).

Five characteristics of an innovation determine its rate of adoption: (1) relative advantage, (2) compatibility, (3) complexity, (4) trialability, and (5) observability (Rogers, 2003; Rogers, 2002). Relative advantage is known as whether the innovation is perceived as superior when compared to the previous idea and is considered advantageous. Compatibility refers to the innovation being viewed as consistent with potential adopters’ existing values, past experiences, and needs, while complexity alludes to the degree to which an innovation is perceived as challenging to understand and use. If an innovation can be experimented with, it is considered to have trialability. Observability is measured by the degree to which the innovation's effects are visible to other people (Rogers, 2003; Rogers, 2002).

More specifically, when examining prevention innovations—defined as new ideas requiring action to avoid unwanted consequences at a future time (Rogers, 2003)—the reward from adopting a prevention innovation is often deferred to a later date or, sometimes, not at all. The prevented event did not occur, and thus, is *not* countable or observable. For example, the HPV vaccine protects individuals from certain HPV strains, a behavior unseen to the adopters, meaning they have trouble “seeing” this outcome. Therefore, when compared to non-prevention innovations, prevention innovations have slow rates of adoption (Rogers, 2003).

Given that prevention innovations (such as the HPV vaccine) may not exhibit characteristics that facilitate quick adoption, what methods can be utilized to increase their adoption rates? Rogers (2002) suggests employing champions (i.e., opinion leaders) who can exert personal influence to encourage the vaccine's adoption. Additionally, activating peer networks also can help diffuse the vaccine. By encouraging peer communication regarding the vaccine, people in the social network will begin talking about the HPV vaccine, thereby giving it meaning, which can, over time, lead to adoption (Rogers, 2002).

Communication Channels

Communication channels are vital to the diffusion process and consist of methods employed in passing along a message from one person to another (Rogers, 2003), what many diffusion researchers refer to as a *social process* (Dearing, 2009). Although knowledge can be obtained through a one-way communication method—particularly with searching capabilities of new communication technologies—persuasion

toward adopting a new idea actually occurs via a two-step flow communication model. Persuasion in the two-step flow model comprises local informal opinion leaders, who are in the center of the social networks, spreading their knowledge, views, and behaviors outward, through the network (Dearing, 2009).

Diffusion of Innovations researchers have tested the two-step flow model extensively and it has proven useful for understanding communication flow within the context of communication channels. In this model, the initial step comprises a media source (e.g., radio, print, mass media) transferring information to an opinion leader (Katz & Lazarsfeld, 1955; Rogers, 2003), who is then influenced by the media source (Katz & Lazarsfeld, 1955). Information is then filtered by the opinion leader and translated to his/her followers (Katz & Lazarsfeld, 1955; Rogers, 2003). During the second step, not only is information spread, but so is the opinion leader's interpersonal influence. Simply put, a message flows from mass media, to opinion leaders, to their followers (Rogers, 2003)—but it does not flow in its “pure” original state. Once the message reaches the followers, it has been shaped by the opinion leaders' own views and experiences with the innovation.

However, the communication process does not always involve two steps (Rogers, 2003). When mass media directly influences a person's adoption of the innovation, there may only be one-step. Other cases may involve multiple stages in the transmission of information (Rogers, 2003; Waldrop, 1992).

According to the DOI theory, mass media channels are more successful in creating innovation *knowledge*, while interpersonal channels are more effective in

developing and altering *attitudes* toward an innovation (Rogers, 2003; Rogers, 2002), thereby affecting people's decision to accept or discard a new idea (Rogers, 2002). Mass media involves transmitting messages via broadcast media such as radio, television, newspapers, social media, and the Internet. Interpersonal communication, according to the theory, is a face-to-face exchange between people. Most people evaluate an innovation, not through scientific research conducted by experts, but through the subjective assessment of the innovation by "near peers"—role models whose behavior tends to be copied by others in their social system (Rogers, 2003; Rogers, 2002). In other words, diffusion is a social phenomenon that occurs as people talk to other people, spreading a new idea (Rogers, 2002).

When an innovation is perceived to be *risky*, information in Web sites, presentations, brochures, training workshops, and one-on-one counseling appears to lack the necessary elements to move people away from uncertainty, towards a positive decision (Bero et al., 1998; Lomas et al., 1991; Thompson, Estabrooks, & Degner, 2006). In order to increase positive decisions, as well as to assist in reasoned judgments and empirical decision making, a dual-method intervention that utilizes both the information channels—mass media—and influential channels (Bandura, 1997)—opinion leaders—is needed (Saladek, Phillips, & Bond, 2006).

Because opinion leaders act as influential channels and have the ability to communicate positive health messages (Green, Ottoson, Garcia, & Hiatt, 2009; Valente & Pumpuang, 2007), school nurses can be considered influential channels. For example, research findings showed nurses had stronger attitudes—compared to school personnel

without healthcare training—towards vaccines’ use and safety and these attitudes were associated with lower vaccine *exemption* rates in the school (Salmon et al., 2004). These results suggest school nurses’ communicate their attitudes about vaccines, which in turn possibly influence vaccination behaviors. School nurses, therefore, obtain health information about risky innovations (e.g., HPV vaccine) and shape the information, adapting it to various audiences.

Social Systems

Diffusion of Innovations theory defines social systems as sets of interrelated groups of people involved in problem solving to reach a common goal (Rogers, 2003). All system members contribute to finding solutions to a common problem/issue. Social systems are included in the DOI theory because diffusion occurs inside a social system and the system’s structure affects the diffusion process and outcomes. The social system represents “boundaries” within which an innovation will (or will not) diffuse (Rogers, 2003).

For over 50 years, scholars have noted the impact of interpersonal relationships on adoption behaviors (Valente, 1995; Valente & Davis, 1999), especially relationships with opinion leaders in a system. Social systems incorporate opinion leaders who frequently influence other people's attitudes or behaviors (Rogers, 2003). Opinion leaders—also referred to as champions, lay health advisors, health advocates, and community leaders (Valente & Pumpuang, 2007)—provide information and advice about innovations to other members of the social system. According to the DOI theory, to become and remain an opinion leader, the person must be competent, accessible, and

conform to that particular system's norms. By conforming to social norms, opinion leaders provide a model for the innovation's acceptance or rejection (Rogers, 2003). Being perceived as an opinion leader allows the leader to remove barriers and increase the rate of diffusion (Valente & Davis, 1999). Diffusion within interpersonal networks considers both principles of learning theory (Bandura, 1986) and diffusion (Rogers, 2003; Valente, 1993; Valente & Rogers, 1995); learning is most efficient when people are taught or trained by near peers selected to be models of that behavior (Rice, 1993).

DOI theory characterizes opinion leaders as those who experience: (1) greater exposure to mass media, (2) greater contact with change agents, (3) higher socioeconomic status and (4) greater social participation (Rogers, 2003). Although opinion leaders tend to have higher socioeconomic status than their followers, the most notable characteristic is their influential role in the *communication structure*. Because socioeconomic status allows broader access to various social groups, opinion leaders engage in face-to-face communication about new ideas at formal meetings and informal discussions more often than their followers. Opinion leaders find themselves, therefore, at the center of interpersonal communication networks in the diffusion process (Rogers, 2003).

Opinion leaders' importance in the diffusion process has been documented in numerous studies and experiments reporting how opinion leaders foster behavior change related to HIV prevention, adoption of mammography, and prevention of heart disease, among others (Rogers, 2003). Because they have demonstrated impact on health improvement (Rogers, 2003), opinions leaders have been utilized to gain support in

public health and community health programs (Valente & Pumpuang, 2007). Opinion leaders have been used to implement programs because when there is uncertainty regarding an innovation, people tend to search for information and evaluative judgments from trusted and respected people in the social system (Dearing, 2009). Opinion leaders encourage others to know about the innovation and know where to direct followers to receive more information (Dearing, 2009). Thus, identifying and utilizing opinion leaders can contribute substantially to enhancing the diffusion process within health services.

School nurses can be considered opinion leaders because of their role and position within schools. School nurses are opinion leaders that function across multiple social systems such as hospitals (Soumerai et al., 1998) and schools (Valente, Hoffman, Ritt-Olson, Lichtman, & Johnson, 2003) because they have greater contact with change agents (e.g., physicians or clinicians) and social participation. School nurses are considered connectors between healthcare professionals, students, parents, school staff, and communities (American Academy of Pediatrics Council on School Health, 2008). This connector status provides school nurses with access to various social groups and places school nurses in the center of interpersonal communication networks regarding school health issues and concerns.

Time

In much of the behavioral science research, *time*—as a focal variable—is often neglected. In the DOI theory, it is the fourth crucial element characterizing the diffusion process (Rogers, 2003). Time affects the following three processes: (1) the innovation-

decision process, (2) a person or unit's innovativeness, and (3) an innovation's rate of adoption. For the purposes of our argument, we will only discuss how time influences the innovation-decision process. To explore the concepts of unit innovativeness and rate of adoption further, see Rogers, 2003.

The innovation-decision process begins with knowing about the innovation and ends with accepting or rejecting it (Rogers, 2003). This process includes five steps in a time ordered-sequence: (1) knowledge, (2) persuasion, (3) decision, (4) implementation, and (5) confirmation. Knowledge occurs when a person learns of the innovation and understands its function. In persuasion, the person is coaxed into developing a favorable or unfavorable attitude towards the innovation. Implementation occurs when the person uses the innovation. Re-invention, a change in the innovation by the users, can take place during the implementation stage. Confirmation occurs when a person attempts to find support for the already-made decision to adopt the innovation. At any time, nonetheless, the person may change his/her previous decision if exposed to conflicting information about the innovation (Rogers, 2003).

The innovation-decision period is the time needed to move through these five steps (Rogers, 2003). People differ in the time required to go through the process, with some taking many years to adopt an innovation while others move rapidly.

During the knowledge and persuasion stages, communication channels play a vital role. At the knowledge stage, a person wants to know about the *what*, *how*, and *why* of the innovation (Rogers, 2003). Mass media communication channels are more effective in providing general information during the knowledge stage. Then, during the

persuasion stage, a person wants to know the innovation's advantages and disadvantages for him/her, in particular. Near peers—interpersonal communicators—are people who provide personal assessments of the innovation. Because mass media provide a “one-size-fits-all” message about the innovation, it is not as beneficial in the persuasion stage as evaluations from near peers, whose opinion can influence adopters' choices at both the decision and confirmation stages (Rogers, 2003).

More specifically when examining the HPV vaccine, literature reviews reported knowledge of HPV to be low in the general population (Brewer & Fazekas, 2007; Gamble, Klosky, Parra, & Randolph, 2010; Herzog, Huh, Downs, Smith, & Monk, 2008; Jenson, 2009; Kollar & Kahn, 2008; Zimet, 2006). If knowledge about the disease is low, more often than not, knowledge about the vaccine will also be low. However, to increase knowledge and positive attitudes towards the HPV vaccine, school nurses can provide education and professional assessment of the HPV vaccine to parents and students still forming attitudes about the new vaccine. Because “one-size-fits-all” health messages may not be effective in behavior change (Kollar & Kahn, 2008), school nurses can provide tailored messages to parents and students.

Implications for School Health

To address the low HPV vaccination rates among youth in the US, we argue school nurses can function strategically as opinion leaders within the school system, thus providing a solution to increase these rates. In exploring school nurses' role as opinion leaders, Burt (1999) further adds that opinion leaders are not merely leaders *within* a system, but also a broker *among* groups in a system. School nurses are liaisons among

students, school staff, healthcare professionals, families and communities (American Academy of Pediatrics Council on School Health, 2008). Thus, school nurses function as informal interpersonal communication channels among multiple academic and medical sources, parents, and students.

School nurses possess a special type of leadership position, as they are able to influence both policies and programs due to their cross-disciplinary understanding of educational and health systems (Baisch et al., 2011; American Academy of Pediatrics Council on School Health, 2008). Such leadership commonly extends to providing input and making decisions about health education curriculum, as well (American Academy of Pediatrics Council on School Health, 2008). Because school nurses represent the healthcare system (to parents and students), they are positioned to assist parents not only with education about health, but also with decisions regarding their children's healthcare (Baisch et al., 2011; American Academy of Pediatrics Council on School Health, 2008).

In addition to understanding school nurses' roles as opinion leaders, it is important to understand their views of the HPV vaccine for youth, because—as described above—opinion leaders' attitudes affect the diffusion process (Rogers, 2003). To understand school nurses' attitudes, their role in the *persuasion stage* of the innovation-decision process must be examined. According to the theory, it is during this stage that school nurses develop favorable or unfavorable attitudes towards the HPV vaccine. They use their own communication channels (other school nurses, doctors, and clinical nurses) to develop these attitudes. Once an attitude is formed, there is an assumption that behavior will follow: the HPV vaccine will be accepted or rejected,

according to whether the attitude is favorable or unfavorable. However, congruence between attitude and behavior is not always the case; the behavior may be dissimilar to the attitude. This is not uncommon regarding many preventive health innovations, such as contraceptives (Rogers, 2003). This discrepancy is known as the KAP-gap (KAP refers to *knowledge, attitudes, and practice*; Rogers, 2003) and, to date, school nurses' KAP-gap as well as their perceptions of their role as opinion leaders have not been systematically examined.

In order to address this deficiency in the current literature, it is important to, first, understand school nurses' role, theoretically. For this, the DOI theory provides a useful lens through which researchers and practitioners in health promotion can comprehend the vaccine dissemination process and engage school nurses in the efforts to promote HPV vaccine for youth.

Limitations

Although useful, the DOI framework suffers from important limitations. Among these are DOI's inherent biases, such as a pro-innovation and individual-blame bias (Rogers, 2003). The assumption underlying the theory and most of the research employing DOI theory is that all members of a given system *should* or *will* adopt an innovation and the innovation should not be rejected nor re-invented. This can be a problematic assumption, leading to diffusion researchers underemphasizing rejection, ignoring re-invention, and failing to examine anti-diffusion programs. Due to this inherent bias, researchers know more about innovation success than failures (Rogers, 2003).

The pro-innovation bias is an important limitation to recognize because within this article we have made the assumption certain opinion leaders—specifically, school nurses—*should* support and promote HPV vaccination for adolescents. However, this proposition is unlikely to be true for all school nurses, and in some cases might not even be feasible. Research is important to determine school nurses’ views of the vaccine as an innovation, and their support (or lack thereof) for the HPV vaccine.

Individual-blame bias, on the other hand, is the inclination to blame people for difficulties during diffusion, rather than faulting the system. As Rogers reminds us, individual-blame bias is reflected in the saying, “If the shoe doesn’t fit, there is something wrong with your foot” (2003, p. 119). However, a more fruitful strategy might be to examine the *systems*, not the individual, when searching for breakdowns in the diffusion process. This different point of view might reveal the “shoe manufacturer or the marketing system could be at fault for the shoe that does not fit” (Rogers, 2003, p. 119).

Individual-blame bias is, potentially, the most important limitation that our argument for using the DOI theory faces. When researchers focus on understanding school nurses’ role in the HPV vaccination uptake for youth, they (the researchers) are tempted to ignore contextual or systemic factors that might be at play, such as policies, legislation, or even availability of resources. For example, some states have legislation prohibiting school nurses from recommending non-mandated vaccinations. If school nurses do recommend vaccines, school districts may be held accountable for the vaccine’s cost. In addition, not all schools have the resources to provide HPV

vaccination education and information to parents and students, regardless of the efforts their nurses exert. Therefore, when examining school nurses as opinion leaders, researchers also must be sensitive to this potential bias.

Conclusion

Despite inherent limitations, we believe DOI theory offers a fruitful, elegant narrative for understanding and engaging school nurses as opinion leaders for promoting the HPV vaccine among youth. *Why* there have not been concerted attempts to understand and involve US school nurse populations remains a mystery.

CHAPTER III
HEALTHCARE PROVIDERS AND THE HPV VACCINE: A SYSTEMATIC
REVIEW

Introduction

Vaccinations were named by the Centers for Disease Control and Prevention (CDC) in 1999 as one of the 10 greatest public health achievements of the century. Despite the magnitude of vaccination's health achievements, some vaccines have encountered less-than-enthusiastic responses and acceptance from various populations.

While some vaccinations for children and adolescents—Td (tetanus-diphtheria) or Tdap (tetanus-diphtheria-pertussis), MenACWY (meningococcal conjugate), and Varicella (chicken pox)—are well received, with uptake rates of 78%, 71%, and 68% respectively, the Human Papillomavirus (HPV) vaccination rates remain relatively low among teenagers in the United States (US; CDC, 2012a). Since its approval in 2006 (for females) and 2009 (for males) by the Food and Drug Administration (FDA), only an estimated 53% of female teens and 8% of male teens have been vaccinated with the *first* of the three required doses. Furthermore, an estimated 35% of adolescent females have received *all three* recommended doses (CDC, 2012a).

HPV, the most common sexually transmitted infection (STI), has affected an estimated 79 million Americans by 2013 while approximately 14 million will become infected with the virus, annually (CDC, 2013b). Furthermore, 75% of these new HPV cases will occur in people aged 15-24 (Weinstock et al., 2004). In particular, 45% of 20-

24 year old females were estimated to be infected with HPV in 2007, with 14-19 year old girls having a high likelihood of acquiring HPV (Dunne et al., 2007).

HPV is extremely common and linked with nearly all cases of cervical cancer (World Health Organization, 2009); however, the HPV vaccine helps protect against HPV and HPV-related cancers. Currently, there are two vaccines (Cervarix and Gardasil) to protect against the HPV strains causing most cervical cancer cases (CDC, 2013c). Gardasil has also been shown to protect against most genital warts (in males and females), anal cancer (in males and females), and vaginal and vulvar cancers. However, the vaccine provides the greatest benefit if a person receives all three doses and develops an immune response before sexual initiation, which is the reason the vaccine is recommended for preadolescent boys and girls (CDC, 2013c). While the HPV vaccine confers obvious health benefits, vaccination rates remain low for adolescents in the US.

Even though there are low vaccination rates among adolescents, numerous agencies and organizations have published objectives and recommendations to increase HPV vaccination rates. *Healthy People 2020* included an objective to increase the three dose HPV vaccine uptake among females—ages 13-15 years—from 23% in 2009 to 80% by 2020 (US Department of Health and Human Services, 2012). Along with the FDA, in 2006 the Advisory Committee on Immunization Practices (ACIP) recommended girls 11-12 years old routinely receive the HPV vaccine, and 13-26 year old women receive the vaccine—in order to “catch up”—to prevent cervical, vaginal, and vulvar cancers (CDC, 2010a; CDC, 2010b). The HPV vaccine recommendation has received support by other national health agencies and professional organizations

including, but not limited to, American Academy of Pediatrics (Committee on Infectious Diseases, 2007), National Cancer Institute, CDC (CDC, 2007) and National Association of School Nurses (Burch, Inderbitzin, Robarge, & Zacharski, 2010).

However, recommendations and support from national health agencies and professional organizations do not guarantee vaccine acceptance by the public. In fact, multiple factors affect adolescents' vaccination rates including the adolescents themselves, their parents, and healthcare providers. Previous literature reviews have summarized findings concerning adolescents' and parents' HPV vaccine knowledge, attitudes, and perceptions (Brewer & Fazekas, 2007; Dempsey & Zimet, 2008; Jenson, 2009; Kessels et al., 2012; Kollar & Kahn, 2008). Few reviews have included healthcare providers in addition to adolescents and parents (Bartlett & Peterson, 2011; Fisher, Darrow, Tranter, & Williams, 2008; Gamble et al., 2010; Herzog et al., 2008; Zimet, 2005; Zimet, 2006). However, less attention has been paid *exclusively* to healthcare providers and health educators, their views and practice regarding the HPV vaccine for youth.

Thus, the purpose of this review is to systematically summarize and empirically examine the scientific research literature examining healthcare providers and health educators, their knowledge, attitudes, and professional practice concerning the HPV vaccine among youth. For this review, healthcare provider was defined as an individual qualified to provide and deliver healthcare (e.g., pediatricians, physicians, clinical nurses, school nurses). Health educator was defined as a person who promotes, helps maintain and improve both individuals' and communities' health through support for

engaging in healthy behaviors (US Department of Labor Bureau of Labor Statistics, 2009). Additionally, the reviewed literature was examined for methodology quality, including use of theoretical frameworks and statistical analytic methods. Describing methodological quality is vital because such description captures the literature's overall strength and allows the reader to draw conclusions about the generalizability and biases in findings (Schulz, Chalmers, Hayes, & Altman, 1995).

Systematic literature reviews allow researchers to identify and map previous studies in a systematic manner (Bennett, Lubben, Hogarth, & Campbell, 2005). Through mapping the literature, researchers can disseminate findings from several studies, establish evidence-based practices, and provide a basis for future studies (Bennett et al., 2005; Bowman, 2007). Moreover, systematic reviews improve the comprehensiveness and objectivity of research, and contribute to the decision-making process about the purpose and quality of health sciences research (Bennett et al., 2005).

Methods

The methodology of this study followed the framework provided by Garrard (2010) and included searching four electronic databases (Medline, Embase, CINAHL, ERIC) using variations and Boolean connectors with the terms *human papillomavirus vaccine*, *health personnel* (nurse, doctors, physician, school nurse, health educator), *health services* (health education, health models), and *adolescents* (child, schoolchildren, boys, girls, youth, preteen, prepubescent, pediatric, paedtric). A trained public health librarian, with experience in organizing and documenting searches for systematic literature reviews, assisted the authors in the search. In addition to the electronic

searches, reference lists of the included studies' were also searched for other, potentially missed, citations.

For inclusion in this review, studies had to: (1) be published in a peer-reviewed, English language journal; (2) be conducted in the US; (3) be original reports of empirical studies; (4) focus on the HPV vaccine; (5) focus on adolescents (between 9-18 years old) receiving the HPV vaccine; and (6) *empirically examine* the knowledge, attitudes, and/or professional practice of the healthcare professionals or health educators regarding the HPV vaccine for youth. Studies were excluded if they utilized qualitative methods or were commentaries, editorial or personal perspective manuscripts. All articles published through June 2012 were retrieved (the date in which searching began). Titles, abstracts, and articles were reviewed and coded for eligibility by the primary author.

Information concerning participant characteristics, theoretical application, study population, and sample size were extracted from eligible studies. Each article's methodological quality was examined by assessing theoretical component, study sample, reliability reporting, and statistical analyses.

Findings

Studies' Characteristics

A total of 2,078 articles were initially identified. After removing duplicates (n = 591), 1,487 articles were screened for inclusion. Twenty-eight publications met the inclusion criteria and were represented in the final sample, while 1,459 were excluded based on eligibility criteria. See Figure 3.1 for article selection and exclusion process.

Eighteen journals published the 28 reviewed studies included in the review. Ten

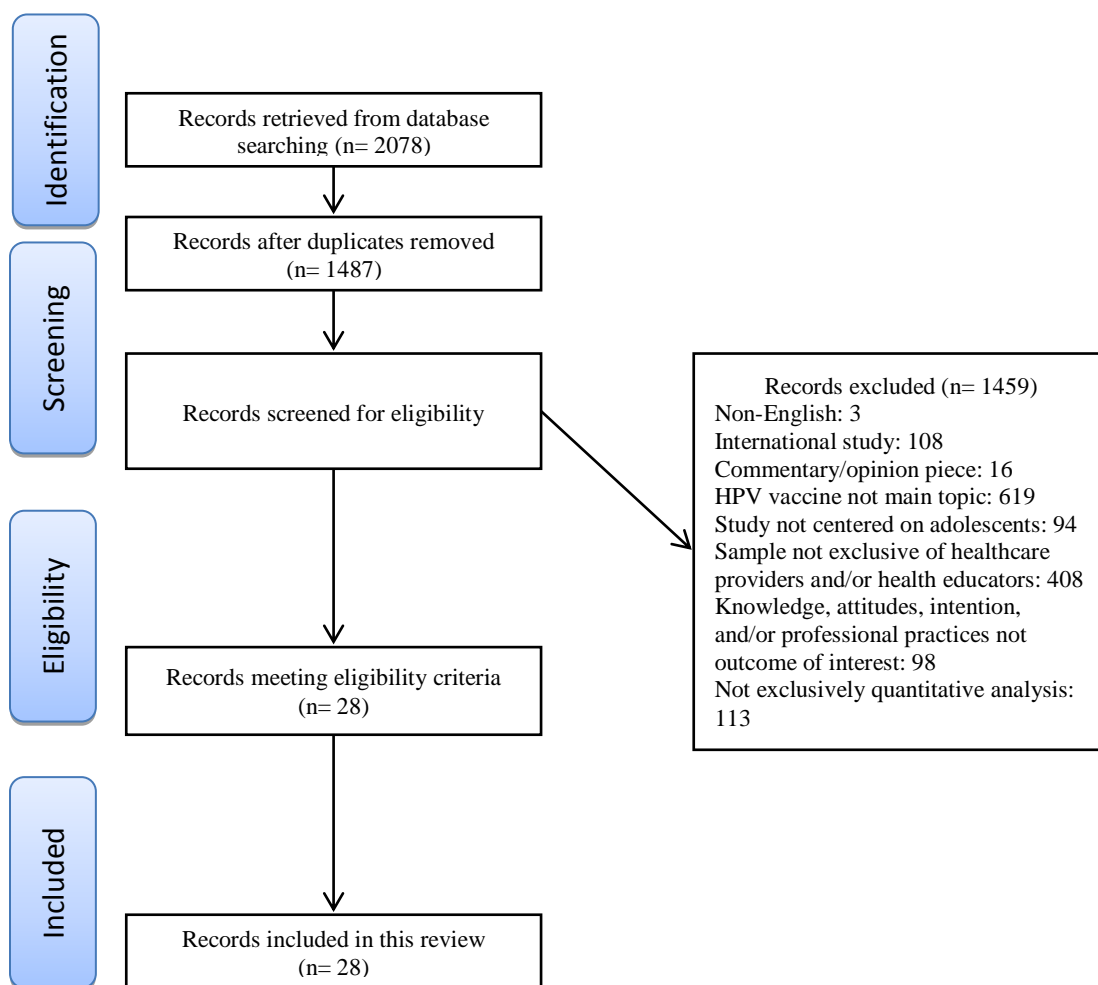


Figure 3.1. Flowchart of articles reviewed for inclusion in sytematic review.

journals had a medical focus, three focused on women’s health, and two centered on community health. The journals publishing the most articles included *Journal of Adolescent Health*, *Journal of Pediatric and Adolescent Gynecology*, and *Journal of Lower Genital Tract Disease*, each published three articles included in this review. Furthermore, four articles were published in 2006 or before (the year in which the HPV

vaccine was approved). There were no articles published in 2007, but in 2008 four manuscripts were published. In 2009 and 2010, publications on this topic increased to six and seven, respectively. Furthermore, there was only one study that examined health educators, therefore, this review's findings focuses on healthcare providers. Refer to Table 3.1 for a complete matrix of study characteristics.

Studies' Findings

In the reviewed studies, five main factors were consistently targeted for study. Major factors included: (1) HPV and HPV *vaccine* knowledge, (2) attitudes, (3) perceptions, (4) intentions, and (5) professional practice. The subsequent findings are organized by these factors and various sub-factors examined in the studies. The first factor, "HPV and HPV *vaccine* knowledge," did not have sub-factors. Under the "attitudes" factor, sub-factors that emerged from data were: (1) communication, (2) patient's behaviors, (3) support for the HPV vaccine, and (4) support for a mandated HPV vaccine. For "perceptions," the following sub-factors were identified: (1) barriers for providing the vaccine, and (2) subjective norms in administering the HPV vaccine. The "intention" factor was defined as "intention to recommend the HPV vaccine." Lastly, "professional practice" comprised three sub-factors: (1) discussing sexuality or HPV vaccine with parents or patients, (2) recommending the HPV vaccine, and (3) providing the HPV vaccine. See Table 3.2 for all factors and sub-factors examined by the reviewed studies.

Table 3.1
Matrix of the 28 Study Characteristics

Study	Pub. Year	Theory	Geographic Area	Analysis Unit	Ss	Study Population	Analytic Methods
Raley et al.	2004	--	National	Individual	207	OBYGYN	Conjoint model (Pearson correlations)
Kahn et al.	2005	Theory of Planned Behavior	National	Individual	513	Pediatricians	Linear mixed modeling
Riedesel et al.	2005	Theory of Planned Behavior	National	Individual	145	Physician	MANOVA, Multivariate linear regression
Daley et al.	2006	--	National	Individual	294	Pediatricians	Multivariate analyses (not specified)
Feemster et al.	2008	--	--	Individual	101	Pediatric Clinicians	EFA, Multivariate logistic regression
Ishibashi et al. (a)	2008	--	National	Individual	373	Pediatricians	Chi-square test, Multivariate logistic regression
Ishibashi et al. (b)	2008	--	National	Individual	373	Pediatricians	Chi-square tests, Fisher exact tests, Multivariate logistic regression
Jaspan et al.	2008	--	Philadelphia, PA	Individual	9	OBYGYN	Descriptive
Huey et al.	2009	--	Pennsylvania	Organization	55 / 49	Primary Care Practices	Descriptive

Table 3.1
Continued

Study	Pub. Year	Theory	Geographic Area	Analysis Unit	Ss	Study Population	Analytic Methods
Jensen et al.	2009	--	Dane County, WI	Individual	204	Physicians, Physician Assistants, and Nurse Practitioners	Descriptive
Kahn et al.	2009	--	Texas	Individual	1122	Family Practice, Pediatricians, OBGYN, Internal Medicine, and Other	Chi-square, Wilcoxon rank-sum, t-test, Multivariate logistic regression
Leddy et al.	2009	--	National and Indiana, Kentucky, Ohio, Michigan, and Ontario, Canada	Individual	1342	OBGYN and Other	Chi-square, ANOVA
Pearce et al.	2009	--	Chattanooga, TN	Individual	95	Pediatric and Family Physicians	Descriptive
Tariq et al.	2009	--	Arkansas	Individual	300	Family physicians, Internal medicine physicians, Pediatricians and OBGYNs	Descriptive, Chi-square, Cramer's V
Askelson et al.	2010	Theory of Planned Behavior	Iowa	Individual	207	Family Practice Physicians, General Practice Physicians, and Pediatricians	t-test, Chi-square, SEM
Barnack et al.	2010	--	National	Individual	100	General Practice, Family Practice, Pediatricians, OBGYNs, and Other	Linear regressions, Backward step-wise, Multiple regression analysis

Table 3.1
Continued

Study	Pub. Year	Theory	Geographic Area	Analysis Unit	Ss	Study Population	Analytic Methods
Daley et al.	2010	--	National	Individual	680	Family Practice, and Pediatricians	Multivariate logistic regression
Ko et al.	2010	--	--	Individual	424	Pediatricians, OBGYNs, and Internists	Multivariate logistic regression
McCave	2010	Theory of Planned Behavior	New Mexico, North Carolina, Texas and Louisiana	Individual	227	Pediatricians, OBGYNs, Physicians, Physicians Assistant, Nurse Practitioner	t-tests, Multiple regression analyses
Schnatz et al.	2010	--	Connecticut	Individual	345	Pediatricians	Descriptive, Spearman rho
Weiss et al.	2010	--	National	Individual	1094	Family Practice and Pediatricians	Chi squared, t-tests, McNemar's tests
Bynum et al.	2011	--	National	Individual	1013	Family Practice, Pediatricians, and OBGYNs	Descriptive, Chi-square tests
Reiter et al.	2011	--	North Carolina	Individual	574	Nurses and Health Educators	Mixed regression models
Roberto et al.	2011	Theory of Reasoned Action/Theory of Planned Behavior	A Midwest state	Individual	406	Pediatricians	t-test, Stepwise regression

Table 3.1
Continued

Study	Pub. Year	Theory	Geographic Area	Analysis Unit	Ss	Study Population	Analytic Methods
Vadaparampil et al.	2011	Competing Demands Model	National	Individual	1013	Family Practice, Pediatricians, OBGYNs	Pearson chi-square, Fisher's Exact test, Simple logistic regression, Multivariate logistic regression
Young et al.	2011	Theory of Planned Behavior and Health Belief Model	Virginia	Individual	385	Family Practice and OBGYN	--
Krieger et al.	2012	Risk Perception Attitude Framework	Kentucky and West Virginia	Individual	334	Pediatricians	t-tests, CFA
Saraiya et al.	2012	--	--	Individual	1500	Primary Care, Pediatricians, and OBGYNs	Logistic regression, Chi-square

Table 3.2
Percentage of the 28 Study's Topics

Topic	n	%
Knowledge		
HPV	9	32.1
HPV vaccine	5	17.8
Attitudes		
Support	8	28.6
Communication	8	28.6
Patient's sexual behavior	7	25.0
Mandated HPV vaccine	4	14.3
HPV vaccine concerns	4	14.3
Administering HPV vaccine	3	10.7
HPV vaccine importance	3	10.7
HPV vaccine delivery success	2	7.1
Perceptions		
Barriers in providing HPV vaccine	12	42.9
Subjective norms regarding HPV vaccine	6	21.4
Patients' sexual behavior	3	10.7
Behavioral control administering HPV vaccine	3	10.7
HPV vaccine	1	3.6
Intention		
HPV vaccine recommendation	11	39.2
Vaccinating against HPV	3	10.7
Communication	1	3.6
Adhering to guidelines/professional recommendations	1	3.6
Professional Practice		
Providing HPV vaccine	10	35.7
Discussing sexuality/HPV vaccine	7	25.0
Recommending HPV vaccine	7	25.0
Offer HPV vaccine	4	14.3
Seeking HPV vaccine information	4	14.3
Barriers in providing HPV vaccine	2	7.1
Discussing HPV	1	3.6

Knowledge of HPV & HPV vaccine. Knowledge of HPV was assessed in nine studies (Daley et al., 2006; Daley et al., 2010; Kahn et al., 2005; Kahn et al., 2009; Pearce et al., 2009; Reiter et al., 2011; Riedesel et al., 2005; Schnatz, Humphrey, & O'Sullivan, 2010; Weiss et al., 2010). In these studies, healthcare providers appeared to have some knowledge of the virus, with correct responses for items assessing HPV knowledge ranging from 22% to 95%—of HPV. Studies reported between 45% to 95% of healthcare providers knew HPV can result in cervical cancer (Daley et al., 2006; Daley et al., 2010; Kahn et al., 2005; Kahn et al., 2009; Reiter et al., 2011; Riedesel et al., 2005).

Knowledge of the HPV *vaccine* was assessed in five studies (Daley et al., 2006; Daley et al., 2010; Leddy et al., 2009; Reiter et al., 2011; Saraiya et al., 2012). One study revealed 98% of physicians reported the HPV vaccine was effective at preventing cervical cancer, but less than 53% reported the vaccine prevents anal cancer (Saraiya et al., 2012). There appeared to be less variation in HPV vaccine knowledge scores ranging from 77% to 91% (Daley et al., 2010).

Attitudes. Six studies revealed healthcare providers reported feeling comfortable discussing sexuality issues, including the HPV vaccine, with adolescents or parents (Daley et al., 2006; Daley et al., 2010; Kahn et al., 2005; McCave, 2010; Pearce et al., 2009; Riedesel et al., 2005). No healthcare provider believed that discussing the HPV vaccine was outside the scope of his/her practice (Pearce et al., 2009). One report found no statistically significant relationship between healthcare provider's gender and comfort in discussing sexuality (Ko et al., 2010).

Seven articles reported very few healthcare providers (ranging from 0% to 35%) believed the HPV vaccine would promote sexual behavior among adolescents (Daley et al., 2006; Daley et al., 2010; Ishibashi, Koopmans, Curlin, Alexander, & Ross, 2008b; Ko et al., 2010; Pearce et al., 2009; Saraiya et al., 2012; Tariq et al., 2009; Young et al., 2011). Male healthcare providers, as well as 26% to 35% of minority healthcare providers, however, believed the vaccine might dissuade patients from receiving routine cervical cancer screening (Ko et al., 2010; Young et al., 2011). Two reports cited between 20% and 60.5% of healthcare providers claimed parents believe the vaccine would encourage child's risky sexual behavior (Daley et al., 2006; Tariq et al., 2009).

Numerous studies assessed support for the HPV vaccine. The studies revealed between 61% to 99% of healthcare providers supported the HPV vaccine (Ishibashi, Koopmans, Curlin, Alexander, & Ross, 2008a; Ishibashi et al., 2008b; Pearce et al., 2009; Tariq et al., 2009). Two other studies found supportive attitudes from healthcare providers regarding the HPV vaccine, believing the vaccine as beneficial, a good idea, and having a positive impact on women's lives (Askelson et al., 2010; McCave, 2010). Another study documented that over 90% of healthcare staff would vaccinate their daughters (Reiter et al., 2011). However, only 36.7% to 38.6% of healthcare providers expressed having a positive experience with the HPV vaccine (e.g., daughter receiving the vaccination; McCave, 2010).

Providers were more likely to support the HPV vaccine if it were used to prevent cervical cancer exclusively or cervical cancer *and* genital warts; they were less likely to support the vaccine if it were used to solely prevent genital warts (Raley et al., 2004).

Four articles also discussed support for a mandated HPV vaccine. Support for a mandated HPV vaccine fell between 34% and 59% across reviewed studies (Kahn et al., 2009; Leddy et al., 2009; Tariq et al., 2009; Young et al., 2011).

Perceptions. In the reviewed literature, researchers conceptualized and assessed perceptions of healthcare providers as: (1) barriers for providing the vaccine and (2) subjective norms regarding the HPV vaccine. The main barrier, vaccine cost—for either the provider or the parents/patients—was identified in 12 of the 28 reports (Askelson et al., 2010; Barnack et al., 2010; Daley et al., 2006; Daley et al., 2010; Jaspan et al., 2008; Kahn et al., 2005; Ko et al., 2010; Leddy et al., 2009; McCave, 2010; Riedesel et al., 2005; Tariq et al., 2009; Young et al., 2011). Other perceived barriers for healthcare providers administering the HPV vaccine included patients or parents refusing because of concerns about vaccine safety (Daley et al., 2010; Jaspan et al., 2008; Kahn et al., 2005; Ko et al., 2010; Riedesel et al., 2005), and parents' concerns the HPV vaccine will lead to increased risky sexual behaviors (Daley et al., 2010; Kahn et al., 2005; Ko et al., 2010; Riedesel et al., 2005).

Six reports measured subjective norms regarding the HPV vaccine. The likelihood of healthcare providers following vaccine recommendations from the American Academy of Pediatrics/Redbook, CDC, and ACIP was above 90% (Kahn et al., 2005; Riedesel et al., 2005). Other studies included in this review consistently found that professional organizations providing information about, and recommending adolescents receive the HPV vaccine impacts the healthcare providers' HPV vaccine

recommendation and administering behaviors (Askelson et al., 2010; Jensen et al., 2009; Kahn et al., 2009; Raley et al., 2004).

Intention. Intention was operationalized in the reviewed studies, mainly, as recommending the HPV vaccine. Out of the ten studies reporting on intention, three found more than 80% of healthcare providers were likely or willing to recommend the HPV vaccine (Barnack et al., 2010; Feemster et al., 2008; Jensen et al., 2009). Yet, only 42% were extremely likely to recommend the HPV vaccine to 11 to 12 year old *males* and 26% were somewhat likely (Kahn et al., 2009). Factors found to be associated with intention to recommend the HPV vaccine included the patient being female (Daley et al., 2006; Kahn et al., 2005; Riedesel et al., 2005), the patient being older (Daley et al., 2006; Kahn et al., 2005; Kahn et al., 2009; Riedesel et al., 2005), healthcare providers' HPV knowledge (Kahn et al., 2005; Kahn et al., 2009; Riedesel et al., 2005), providers' gender (female; Daley et al., 2006; Kahn et al., 2009; Riedesel et al., 2005), healthcare providers' response-efficacy (Krieger et al., 2012) and recommendation by professional organizations (Askelson et al., 2010; Kahn et al., 2005; Riedesel et al., 2005). Conversely, some studies found that HPV knowledge, anticipating parents' concerns relating to sexuality (Feemster et al., 2008), providers' gender (Feemster et al., 2008; Roberto et al., 2011), and HPV vaccine attitudes (Askelson et al., 2010) were *not* associated with recommendation intentions.

Professional Practice. Over 70% of healthcare providers discussed sexuality with adolescents during an appointment (Kahn et al., 2005; Riedesel et al., 2005; Weiss et al., 2010), while over 90% of healthcare providers claimed they were educating

parents about the HPV vaccine (McCave, 2010; Schnatz et al., 2010). However, when asked specifically about having conversations with the patients themselves, only 18% of providers reported doing so (Pearce et al., 2009). The main vaccine benefits healthcare providers reported discussing with patients was prevention of cervical cancer and genital warts (Daley et al., 2010; Jensen et al., 2009). To educate patients about the HPV vaccine, 53% of providers claimed using brochures and verbal messages (Tariq et al., 2009).

Recommending the HPV vaccine was examined in seven reports. Patient's age was an important factor in recommending the HPV vaccine, with middle to late adolescents (13-18 years) receiving the highest percentage of recommendations (between 39% to 98% of healthcare providers said they recommended), followed by adolescents aged 11-12 years (49% to 70% recommended) and adolescents aged 10 years and younger (6% to 34% of providers claimed making recommendations to this age group; Daley et al., 2010; Huey et al., 2009; Kahn et al., 2009; Vadaparampil et al., 2011; Weiss et al., 2010; Young et al., 2011).

Factors related to *not* recommending the HPV vaccine included concerns about the vaccine's safety or efficacy, patients' future screening compliance, inadequate reimbursement, lack of educational materials (Young et al., 2011), belief it is essential to discuss sexuality before recommending the HPV vaccine, and reports more parents refuse the vaccine for younger patients compared to older patients (Daley et al., 2010). One study found that *intention* to recommend the HPV vaccine was *not* associated with HPV vaccine recommendation behavior (Krieger et al., 2012).

Ten studies reported on the actual HPV vaccination delivery by healthcare providers. HPV vaccination delivery varied, with 70% to 98% making the vaccine available in their practices (Daley et al., 2010; Ko et al., 2010; Leddy et al., 2009; Tariq et al., 2009; Young et al., 2011) and patients' vaccination rates ranging between 6% to 67% (Jaspan et al., 2008; Schnatz et al., 2010). Older adolescents were more frequently vaccinated than younger adolescents (Huey et al., 2009; Ko et al., 2010; McCave, 2010; Tariq et al., 2009). However, one study reported the average age range for receiving the vaccine was 19-22 years old (Young et al., 2011) and another study documented that 10.9 years (SD = 1.7) was the mean age for vaccinating patients (Askelson et al., 2010). When looking at predictors of vaccinating patients, fewer barriers and being a pediatrician were associated with higher vaccination rates (McCave, 2010). See Table 3.3 for a summary of the findings.

Table 3.3
Summary of Findings for the 28 Studies

Study	Knowledge	Attitudes	Perceptions	Intention	Professional Practice
Raley et al.	--	Participants supported an HPV vaccine that prevented cervical cancer or cervical cancer AND genital warts versus an HPV vaccine preventing genital warts	ACOG approval of the HPV vaccine was perceived as important	--	--
Kahn et al.	Mean HPV knowledge score = 1.86 (SD = 1.29) of 5.0	84.4% of participants were comfortable discussing adolescent sexuality	Perceived barriers to vaccinating against HPV: parental concern about safety, parental concern about vaccinating against STI, parental reluctance to discuss sexuality, parental concern about encouraged sexual activity, administration costs Over 90% of participants would follow the vaccine recommendation from: American Academy of Pediatrics/Redbook, CDC, Advisory Committee on Immunization Practices	Factors associated with intention to recommend HPV vaccine: patient gender, patient age, vaccine type, interaction of patient age and gender, interaction of patient age and vaccine type, interaction of patient gender and vaccine type Participants more likely to recommend a cervical cancer/genital wart vaccine to girls than cervical cancer vaccine Participants more likely to recommend a cervical cancer/genital wart vaccine to girls than boys and cervical cancer vaccine to boys	Over 80% of participants discuss sexuality with patients almost all of the time/most of the time

Table 3.3
Continued

Study	Knowledge	Attitudes	Perceptions	Intention	Professional Practice
				<p>Participants more likely to recommend vaccine to 17 year old than 14 year old or a 11 year old and more likely to recommend to a 14 year old than 11 year old</p>	
				<p>Variable associated with intention to recommend cervical cancer vaccine: provider age and gender (male), 10-15 year old patients seen for routine health visits, perceived % of sexually active 15 year old patients, likely to follow recommendation from influential person or organization (normative beliefs)</p>	

Table 3.3
Continued

Study	Knowledge	Attitudes	Perceptions	Intention	Professional Practice
				Variable associated with intention to recommend cervical cancer/genital warts vaccine: 10-15 year old patients seen per week, HPV knowledge, perceived % of sexually active 15 year old patients, likely to follow recommendation from influential person or organization (normative beliefs), fewer perceived barriers to recommending vaccine	
Riedesel et al.	Mean HPV knowledge score = 2.9 (SD = 1.1) of 5.0	90.9% of participants were comfortable addressing adolescent sexuality	Perceived barriers to vaccinating against HPV: parental concern about safety, parental concern about vaccinating against STI, parental reluctance to discuss sexuality, parental concern about encouraged sexual activity, cost to provider's practice, parental belief child is singled out for STI vaccine, provider reluctance to discuss sexuality	Providers were more likely to intend to recommend the HPV vaccine to females than males, older adolescents than younger adolescents, and a vaccine protecting against cervical cancer and genital warts compared to a vaccine protecting only against cervical cancer	Over 70% of participants discuss sexuality with patients almost all of the time/most of the time

Table 3.3
Continued

Study	Knowledge	Attitudes	Perceptions	Intention	Professional Practice
			Over 90% of participants would follow the vaccine recommendation from: American Academy of Family Physicians, American Academy of Pediatrics/Redbook, CDC, Advisory Committee on Immunization Practices	<p>Variables associated with intention to recommend cervical cancer vaccine: provider gender (female), stronger normative beliefs (influential individuals or organizations)</p> <p>Variables associated with intention to recommend cervical cancer and genital wart vaccine: better HPV knowledge, stronger normative beliefs (influential individuals or organizations), fewer perceived barriers to vaccination and control to vaccinate</p>	
Daley et al.	<p>Participants' HPV knowledge varied according to sub-topic</p> <p>43% of participants unaware of highly effective HPV vaccines under development</p>	88% and 93% of participants were comfortable discussing sexuality with female and male patients, respectively	Perceived barriers to vaccinating against HPV: lack of reimbursement, up-front practice costs of vaccine, parental refusal	Participants more likely to recommend vaccine to older adolescents than younger adolescents and females compared to males	--

Table 3.3
Continued

Study	Knowledge	Attitudes	Perceptions	Intention	Professional Practice
		60.5% believed parents might be concerned the HPV vaccine could increase adolescents' risky sexual behaviors, 10.7% of participants had this same concern		Participants unlikely to recommend vaccine to any age groups were more likely to be males and feel uncomfortable discussing sexuality with female patients	
				Variables associated with being likely to vaccinate 10-12 year old females: knowledge about HPV vaccine being developed, believing that other adolescent vaccine would facilitate introducing HPV vaccine	
				Variables negatively associated with being likely to vaccinate 10-12 year old females: believing it necessary to discuss sexuality before vaccination, parents' concern about STI vaccine for young adolescents, parental refusal as a barrier	

Table 3.3
Continued

Study	Knowledge	Attitudes	Perceptions	Intention	Professional Practice
				Female providers were more likely than males providers to foresee themselves vaccinating male patients	
Feemster et al.	--	--	--	96% of participants reported being extremely likely or somewhat likely to recommend the vaccine to 11- to 12- old females Variables associated with likelihood of intention to vaccinate 11-12 year old girls: being an early adopter of new technologies, anticipating parental concerns regarding vaccine efficacy and safety	--

Table 3.3
Continued

Study	Knowledge	Attitudes	Perceptions	Intention	Professional Practice
				Variables not associated with intention to vaccinate: provider's gender, comfort level of discussing sexuality with 11-12 year old patients, HPV knowledge, anticipating parental concerns about sexuality, provider concerns about sexuality, anticipate prevention benefits of HPV vaccine, anticipant mandates improving vaccine delivery success, increased perception of patient risk	
Ishibashi et al. (a)	--	99% of paediatricians support the HPV vaccine	--	--	88% of participants would give HPV vaccine to all eligible patients Those who would not provide HPV vaccine were more likely to: be paediatricians, have high intrinsic religiosity, be conservative, be late adopters of new drugs/vaccines, be less likely to encourage vaccinating daughter or close friend's daughter

Table 3.3
Continued

Study	Knowledge	Attitudes	Perceptions	Intention	Professional Practice
					There was no predictive demographic variable for not providing the vaccine
Ishibashi et al. (b)	--	<p>Compared to the general public, pediatricians were less likely to believe the HPV vaccine would encourage sexual activity and more likely to support the HPV vaccine without parental permission</p> <p>No variable was a predictor for believing routine Pap smears were better method of preventing cervical cancer or that the HPV vaccine would encourage sexual activity</p> <p>Gender was not a predictor for any item: parental permission, vaccine encourages sex, or abstinence program was better prevention method</p>	--	--	--

Table 3.3
Continued

Study	Knowledge	Attitudes	Perceptions	Intention	Professional Practice
Jaspan et al.	--	--	33% of participants reported barriers: patients concerned about safety, costs	--	HPV vaccine was provided to 28.2% of female patients HPV vaccination rates varied between 6% to 55.8%
Huey et al.	--	--	--	--	90% of practices reported patients requesting vaccine for themselves or their daughters 94% of practices reported recommending the vaccine to patients 22% of practices reported vaccinating only those aged 18 to 26 39% of practices reported vaccinating only those younger than 18 years 24% of practices reported vaccinating both age groups (younger than 18 and 18 to 26) 15% of practices did not report vaccinating specific age groups

Table 3.3
Continued

Study	Knowledge	Attitudes	Perceptions	Intention	Professional Practice
Jensen et al.	--	--	Health professional associations and FDA recommendations influenced participants' decisions to recommend the HPV vaccine	<p>Health benefits from vaccination practitioners plan to discuss with patients were the decreased risk: of cervical cancer, HPV infection, genital warts, any STI</p> <p>95% of participants reported willingness to recommend HPV vaccine to adolescent patients</p> <p>Participants reporting unwillingness to recommend HPV vaccine cited reasons as lack of fit with practice and taking the "wait and see" approach</p> <p>67% of participants were planning to recommend the vaccine to female patients only</p> <p>14% of participants were planning on recommending to females and males</p>	Participants reported feeling comfortable vaccinating patients older than 10 years and uncomfortable vaccinating patients younger 10 years

Table 3.3
Continued

Study	Knowledge	Attitudes	Perceptions	Intention	Professional Practice
				13% of participants were planning on recommending to a majority of female and some male patients	
Kahn et al.	<p>HPV knowledge was fair ranging from 22%-75%</p> <p>44% of participants reported having more HPV information would be helpful</p>	<p>41.7% of participants agreed the HPV vaccine should be mandated for 11-12 year old females in Texas</p> <p>Predictors of agreement with HPV vaccine mandate: seeing more patients covered by Medicaid and academic versus nonacademic patient care</p>	<p>Most valued sources to HPV vaccine information: professional organizations, academic article and journals, professional conferences or meetings</p>	<p>Participants more likely to recommend HPV vaccine to boys between 13-17 years, followed by 18-26 years, 11-12years, and 9-10 years</p> <p>Higher knowledge about HPV, female provider, belief vaccine should be mandated for 11-12 year old girls in Texas were independently associated with intention to recommend HPV vaccine to 11-12 year old boy</p>	<p>81% of participants reported having recommended an HPV vaccine to patients of any age</p> <p>Participants reported recommending vaccination to females 13-17 years the most, followed by 18-26 year old, 11-12 year olds, and then 9-10 year olds</p> <p>Variables predicting recommending HPV vaccine to 11-12 year old females included: higher HPV knowledge about HPV, perceiving professional organizations and conferences as valuable sources of HPV vaccine, belief for mandated HPV vaccine for school enrollment, experience of higher number of barriers to vaccinate</p>

Table 3.3
Continued

Study	Knowledge	Attitudes	Perceptions	Intention	Professional Practice
Leddy et al.	22.9% and 29.4% of participants answered all items about the HPV vaccine correctly	<p>In District V, 39.8% of participants agreed with a mandated HPV vaccine</p> <p>34.4% of CARN participants agreed with a mandated HPV vaccine</p> <p>The main reason to not mandate the HPV vaccine was financial cost to patient</p>	District V and CARN participants named the following as barriers to vaccinating against HPV: patient refuses vaccine based on cost, patient does not feel at risk for HPV	--	<p>District V: participants with higher HPV vaccine knowledge were more likely to give vaccine in office</p> <p>District V: of the participant who give vaccines, 87.6% administer the HPV vaccine</p> <p>CARN: no relationship between participants' HPV vaccine knowledge and providing vaccine in office</p> <p>CARN: of the participant who give vaccines, 91.0% administer the HPV vaccine</p>
Pearce et al.	All participants reported some HPV knowledge	<p>85% and 78% of participants were comfortable counseling parents about STIs and counseling/providing the HPV vaccine, respectively</p> <p>No participant felt the HPV vaccine encouraged sexual activity</p> <p>No participant felt that providing the vaccine was outside scope of practice</p>	--	--	18% of participants who indicated feeling comfortable counseling and providing the HPV vaccine have already discussed the vaccine with some patients

Table 3.3
Continued

Study	Knowledge	Attitudes	Perceptions	Intention	Professional Practice
		63% of participants believed males and females should receive the HPV vaccine			
Tariq et al.	--	<p>Less than 35% of participants agreed with a mandated HPV vaccine</p> <p>80% of participants did not think the vaccine encourages sexual activity</p> <p>20% of participants thought parents believed the vaccine did encourage sexual activity</p> <p>61% of participants felt males should receive the vaccine</p>	Perceived barriers to vaccinating against HPV: cost of administering the vaccine, parents think the vaccine costs too much, compliance of three series shot	--	<p>53% and 35% of participants use both brochures and verbal messages, and only verbal messages, respectively, to provide HPV vaccine education</p> <p>92% of participants felt comfortable providing HPV vaccine education</p> <p>Participants not providing the vaccine were more likely to believe the three shot series limits compliance for completion</p> <p>Participants reported vaccinating females 15-19 years the most, followed by 9-14 year old, and then 20-26 year olds</p> <p>73% of participants provide vaccine in office</p>

Table 3.3
Continued

Study	Knowledge	Attitudes	Perceptions	Intention	Professional Practice
Askelson et al.	--	Participants overall had positive attitudes towards the HPV vaccine	<p>Perceived barriers to vaccinating against HPV: cost, parents</p> <p>Most participants perceived that people important to them think they should vaccinate based on recommendation, that they were expected to vaccinated based on recommendations, and professional whose opinions they valued think they should vaccinated based on recommendations</p>	<p>Majority of participants intended to adhere to ACIP's recommendations</p> <p>86.5% of participants reported they intend to vaccinate female patients</p> <p>Good model fit for attitudes to vaccinate, subjective norms, perceived behavioral control predicting intention to vaccinate</p> <p>Subjective norms and perceived behavioral control were associated with intention to vaccinate</p> <p>Attitudes to vaccinate were not significantly related to intention to vaccinate</p>	Mean age for giving HPV vaccine to patients was 10.93 years
Barnack et al.	--	--	63% of participants reported the costs of the HPV vaccine as a barrier to vaccination	82% of participants plan to recommend parents to vaccinate child against HPV	--

Table 3.3
Continued

Study	Knowledge	Attitudes	Perceptions	Intention	Professional Practice
				Physician specialty was associated with intent to recommend the vaccine (pediatricians had highest mean intention score compared to general practitioner, and OB/GYN)	
				Physician specialty and intent to vaccinate own child were significant predictors for intention to recommend vaccine	
Daley et al.	<p>HPV knowledge varied and ranged from 43%-95%</p> <p>HPV vaccine knowledge had less variation with ranges between 77%-91%</p>	<p>Large majority of participants were comfortable discussing sexuality with female patients</p> <p>Less than 10% of participants believed the vaccine would encourage risky sexual activity</p>	<p>Perceived barriers to vaccinating against HPV: insurance companies not covering HPV vaccine, lack of reimbursement of HPV vaccine, up-front practice costs, parent concerned about safety, parents concerned about increased risky sexual behavior</p>	--	<p>Participants reported discussing cervical cancer prevention, prevention of genital warts in the patients, and prevention of genital warts in partner</p> <p>More participants strongly recommended the HPV vaccine for older age groups: 16-18 years, followed by 19-26 years, 13-15 years, 11-12 years, and then 9-10 years</p>

Table 3.3
Continued

Study	Knowledge	Attitudes	Perceptions	Intention	Professional Practice
					Variables associated with not recommending the HPV vaccine to females 11-21 years included: believing it is necessary to discuss sexuality before recommending HPV vaccine, reporting the time it takes to discuss HPV vaccine, reporting more parental refusals for younger patients compared to older patients
					98% and 88% of participants reported the vaccine was provided in their office
Ko et al.	--	No statistical significance between providers' gender and comfort in discussing sexuality or belief that the vaccine would decrease condom use/increase risky sexual activity Male participants were more likely to believe the vaccine would decrease gynecological examinations and Pap smears	Perceived barriers to vaccinating against HPV: none, reimbursement (costs) concerns, patient or parent concerns about side effects (safety) and increasing risky sexual behavior, patient or parent not asking for vaccine No difference in providers' gender in reporting barriers to vaccinating against HPV	--	90.9% of participants vaccinating females aged 19-26 years 60.5% of participants vaccinating females aged 14-18 years 35.7% of participants vaccinating females aged 9-13 years 10.0% of participants vaccinating females older than 26 years

Table 3.3
Continued

Study	Knowledge	Attitudes	Perceptions	Intention	Professional Practice
					80% of participants reported the vaccine was provided in their office
					Male providers' less likely to provide vaccine than female providers
McCave	--	<p>Over 69% of participants were comfortable discussing the vaccine with parents</p> <p>Over 84% of participants believed the vaccine will have positive impact in women's lives</p> <p>Between 36.7% and 38.6% of participants reported having a positive experience with HPV vaccine (e.g., daughter vaccinated)</p>	<p>Perceived barriers to vaccinating against HPV: concerns about costs for patient and self, professional concerns about HPV vaccine safety, concerns about HPV policy initiative, limited knowledge on HPV vaccine</p>	--	<p>Majority of participants reported counseling parent of HPV vaccine</p> <p>The mean HPV vaccination rate for females 13–17 years was greater than mean HPV vaccination rate for females 9–12 years</p> <p>Fewer barriers was associated with providers' HPV vaccination rates of females 9-12 years</p> <p>Fewer barriers and being a pediatrician was associated with providers' HPV vaccination rates of females 13-17 years</p>

Table 3.3
Continued

Study	Knowledge	Attitudes	Perceptions	Intention	Professional Practice
Schnatz et al.	90.7% of participants reported being "very knowledgeable" or "moderately knowledgeable" about HPV	--	--	Statistically significant correlation between providers' HPV knowledge and willingness to discuss STIs	94% of participants reported discussion of HPV vaccine when discussing STIs No association between self-reported knowledge and providing HPV vaccine Participants reported 67% of parents allowed daughters to receive HPV vaccine
Weiss et al.	Knowledge about HPV in male patients ranged from 19.5%-79%	--	--	--	More participants recommending the HPV vaccine to males and females 13-18 years old, followed by 19-26 year olds, 11-12 years old, and 9-10 year olds Physicians preferred to recommend the HPV vaccine to females
Bynum et al.	--	--	--	--	**Reported HPV vaccine information seeking behavior (not a major theme)
Reiter et al.	Participants reported an increase in self-rated HPV knowledge after the intervention	Healthcare staff participants believed HPV education for the community was valuable	--	--	--

Table 3.3
Continued

Study	Knowledge	Attitudes	Perceptions	Intention	Professional Practice
	After the intervention, there was some increase in HPV and HPV vaccine knowledge	<p>After intervention, 91% of participants would vaccinate their own daughter against HPV</p> <p>After the intervention, an increased number of school staff participants believed HPV and HPV vaccine education was valuable for school personnel, middle school was appropriate for such education, and comfortable with their HPV knowledge if approached by student</p>			
Roberto et al.	--	There were no differences on participants' gender regarding attitudes regarding encouragement of parents to have daughters vaccinated against HPV	There were no differences on participants' gender regarding subjective norms and perceived behavioral control regarding encouragement of parents to have daughters vaccinated against HPV	There were no differences on participants' gender regarding behavioral intentions regarding encouragement of parents to have daughters vaccinated against HPV	There were no differences on participants' gender regarding the behavior of encouraging parents to get daughters vaccinated against HPV

Table 3.3
Continued

Study	Knowledge	Attitudes	Perceptions	Intention	Professional Practice
Vadaparampil et al.	--	--	--	--	34.6% , 52.7%, and 50.2% of participants reported always recommending the HPV vaccine to early, middle, and late adolescents/ young adults, respectively Variables predicting the recommendation of the HPV vaccine included: providers' specialty (specifically pediatricians), being a Hispanic or Latino physician, reporting a less barriers to vaccination
Young et al.	--	26% and 35% of minority participants were concerned the HPV vaccine would increase unprotected sexual intercourse and decrease compliance with cervical cancer screening, respectively Over 90% of participants believed the HPV vaccine was safe, effective, but would decrease the incidence of abnormal pap tests and cervical cancer	Perceived barriers to vaccinating against HPV: reimbursement, cost to parents and patients, no vaccine no stock, not enough discussion time, lacking patients education materials, staff too busy to administer vaccine	53% of participants reported willingness to discuss HPV vaccine with patients	29% of participants reported bringing patients' attention to the HPV vaccine only at annual exam 68% to 72% of providers actively recommend the HPV vaccine to all 16-26 year old females

Table 3.3
Continued

Study	Knowledge	Attitudes	Perceptions	Intention	Professional Practice
		59% of participants supported the state mandate for the HPV vaccine			<p>Variable predicting decreased likelihood of recommending the vaccine were: physicians expressing safety or efficacy concerns, concerns about future compliance with screening, lack of educational materials as a perceived barrier, inadequate reimbursement</p> <p>70% to 73.5% of participants provided HPV vaccine in their practice</p> <p>19-22 years old were reported as most common age of vaccination</p>
Krieger et al.	--	--	--	<p>Mean score for intention to encourage the HPV vaccine = 6.32 (SD = 1.29) of 7.0</p> <p>Healthcare provider response-efficacy was associated with intentions to encourage vaccination</p>	<p>Mean score for having encouraged the HPV vaccine = 5.11 (1.53) of 6.0</p> <p>Intention to encourage the HPV vaccine was not significantly associated with vaccine encouragement</p>

Table 3.3
Continued

Study	Knowledge	Attitudes	Perceptions	Intention	Professional Practice
Saraiya et al.	Percent ranges for HPV vaccine preventing: cervical cancer (97.8%), anal cancer (19.2%-52.4%), and oropharyngeal cancer (9.2%-27.6%)	--	--	--	<p>Significant mean differences in past HPV vaccine encouragement for participants practicing in Appalachia counties compared to non-Appalachia</p> <p>Non-Appalachia participants reported encouraging the HPV vaccine more than Appalachia participants</p> <p>98.9% of participants reported treating patients eligible for HPV vaccine</p>

Methodological Quality. Each of the studies methodological quality was assessed to understand the methods utilized to collect and analyze the data. The use of theory, study sample, data validity and reliability and analytic methods were examined.

Use of theory to guide inquiry. Of the 28 articles reviewed, 29% (n = 8) explicitly cited a theoretical framework to guide the research. The most frequently used theory was the Theory of Reasoned Action/Planned Behavior (Askelson et al., 2010; Kahn et al., 2005; McCave, 2010; Riedesel et al., 2005; Roberto et al., 2011; Young et al., 2011). Other frameworks utilized were the Competing Demand Model (Vadaparampil et al., 2011), Health Belief Model (Young et al., 2011), and Risk Perception Attitude (RPA) framework (Krieger et al., 2012). One study reported using multiple theories (Theory of Planned Behavior and Health Belief Model; Young et al., 2011).

Study sample. More than half of the articles (n = 16, 57%) reported a sample size larger than 300 respondents. Of the 28 manuscripts, 14 (50%) reported local or state-level data. Two reports did not state the data collection location, and 12 (43%) manuscripts conducted research on a national sample. Only one study assessed health educators, with nurses.

Data validity and reliability. We assessed whether each study reported on the reliability/validity of its data. Among the 28 articles reviewed, 16 (57%) explained how validity was assessed for the instrument. Nine studies (32%) described having the instrument pilot-tested or reviewed by experts and eight (29%) reported utilizing items created from other instruments or previous studies. Less than one-third of the reviewed

studies (n = 8, 29%) provided evidence of the data's reliability (e.g., by reporting their level of internal consistency, through Cronbach's alpha).

Analytic methods. In most of the reviewed studies, regression (e.g., multivariate, logistic, linear, step-wise; n = 13, 46%) and chi-square tests (n = 8, 29%) were conducted. The third most commonly employed analysis was t-tests (n= 6, 21%). Less-frequently used statistical analyses included analysis of variance (ANOVA; Leddy et al., 2009), multivariate analysis of variance (MANOVA; Riedesel et al., 2005), exploratory factor analysis (EFA; Feemster et al., 2008), confirmatory factor analysis (CFA; Krieger et al., 2012), and structural equation modeling (SEM; Askelson et al., 2010).

Discussion

We systematically reviewed 28 studies examining healthcare providers' knowledge, attitudes, and/or professional practice regarding the HPV vaccine for youth. However, we found these studies also assessed the perceptions and intentions regarding the HPV vaccine. Furthermore, this review describes these studies' methodological quality, specifically the use of theory, sample size/characteristics, reporting of data's reliability, and data analyses.

This methodological quality assessment indicated the reviewed literature suffers from important methodological limitations. More specifically, in examining use of theory, only 29% of articles cited a theory to guide the research. With less than one-third of the literature guided by theory, important questions remain regarding these studies contribution to knowledge development (Goodson, 2010).

About half (57%) of the articles reported some type of validity assessment and an even smaller number of articles (29%) reported on the data's validity and reliability. Reporting validity/reliability allows other researchers to assess measurement error and the data's reliability impact on effect sizes and statistical power (Henson, 2001). This, in turn, affects the meta-analytic thinking process (Cumming & Finch, 2001).

In addition, only 39% of articles used a multivariate analysis, which has the ability to examine several independent and dependent variables concurrently. Two articles referred to using a step-wise regression analysis, which has, itself, important limitations (see Thompson, 2006 for an overview of the shortcomings of step-wise analyses). Thus, even a cursory examination of methodological quality, such as this one, reveals that research on this topic holds room for improvement in its methods and approaches.

To our knowledge, this is the first extensive review including articles before and after the approval of the HPV vaccine for males and females focusing on healthcare providers' knowledge, attitudes, intentions, perceptions, and professional practice regarding the HPV vaccine for youth. This review points to several noteworthy findings. First, healthcare providers' HPV vaccine knowledge appeared to have less variation than knowledge about the virus itself. Additionally, the majority of participants in the reviewed studies reported feeling comfortable discussing sexuality issues with patients. However, an earlier review, published in 2006, cited studies showing healthcare providers' reluctance to discuss sexuality issues (Zimet, 2006). Healthcare providers' knowledge and comfort level is important because accurate information and effective

communication skills will impact the success of HPV vaccination programs (Zimet, 2005).

Second, although most healthcare providers support the HPV vaccine, the main perceived barrier to administering the vaccine was “cost”. Other barriers included parent/patient safety concerns, and parents’ concerns the HPV vaccine will increase risky sexual behaviors, even though few healthcare providers had this concern themselves.

Because parents’ concerns about the HPV vaccine safety, side effects, and increasing sexual activity (Bartlett & Peterson, 2011; Herzog et al., 2008; Jenson, 2009; Kessels et al., 2012) may be perceived as barriers to vaccinating against HPV, it is vital to examine all dimensions of parents’ knowledge and attitudes and how these relate to providing healthcare services. Numerous literature reviews and studies reported poor or low knowledge about HPV prior to the vaccine’s approval (Gamble et al., 2010; Kollar & Kahn, 2008; Zimet, 2006). However, a recent literature review indicated a majority of parents had at least heard of HPV and the HPV vaccine (Bartlett & Peterson, 2011). Contrary to beliefs that parents are opposed to the HPV vaccine, reports have found parents are willing and interested in vaccinating their children against HPV (Brewer & Fazekas, 2007; Gamble et al., 2010; Herzog et al., 2008; Jenson, 2009; Zimet, Liddon, Rosenthal, Lazcano-Ponce, & Allen, 2006). Parents favor protecting their child from a serious infection, with a vaccine, despite the infection source (Zimet et al., 2006). Furthermore, a review by Gamble et al. (2010) showed adolescents’ acceptance of

vaccines against sexually transmitted infections is high. Despite this documented acceptance of the HPV vaccine, uptake rates among adolescents are still low in the US.

Given the high levels of acceptance and interest, the professional/scientific literature has identified healthcare providers' (e.g., physicians, pediatricians) recommendations as being associated with positive parental and patient attitudes toward vaccinations. Providers' recommendations are also associated with increased vaccine rates (Brewer & Fazekas, 2007; Fisher et al., 2008; Gamble et al., 2010; Garcini, Galvan, & Barnack-Tavlaris, 2012; Jenson, 2009; Kessels et al., 2012; Zimet, 2005; Zimet et al., 2006; Zimet, 2006). Healthcare providers have an important role in providing patient education (i.e., addressing concerns and clarifying misunderstandings) about HPV and the HPV vaccine (Brewer & Fazekas, 2007; Jenson, 2009; Zimet, 2006). Healthcare providers' attitudes and recommendations will continue to influence parents' and patients' HPV vaccine views (Herzog et al., 2008; Jenson, 2009).

In this review, professional organizations' and other professionals' recommendations were identified as factors associated with intending to administer or administering the HPV vaccine. This finding is consistent with other reviews which found endorsements from professional organizations (such as the American Academy of Family Physician, CDC, and the American Academy of Pediatrics/Redbook) were factors for accepting or intending to recommend the HPV vaccine (Gamble et al., 2010; Zimet, 2005; Zimet et al., 2006; Zimet, 2006).

Furthermore, other predictors of intention to recommend the HPV vaccine included the patient being female, the patient being older in age, HPV knowledge, and

providers' gender. Age was also a factor in vaccinating against HPV when comparing older adolescents' vaccination rates to younger adolescents. Confirming these findings, other reviews reported older adolescent patients (Zimet, 2005; Zimet et al., 2006; Zimet, 2006), as well as female patients (Zimet, 2005; Zimet et al., 2006) were more likely to receive a recommendation from a healthcare provider. Given that the CDC recommendation for the HPV vaccine is for 11-12 year old girls *and* boys (CDC, 2013d); there is cause for concern that healthcare providers in these studies are reluctant to vaccinate males and younger adolescents. This same issue was documented by Zimet et al. in 2006, and seven years later still remains a concern.

A majority of these studies focused on healthcare providers' attitudes, intentions, and practices regarding the HPV vaccine for female adolescents. There should be more research regarding healthcare providers' HPV vaccine recommendation to male patients. Encouraging both males and females to receive the vaccine simplifies educational efforts by the medical and health promotion professions and implies the collective responsibility of helping prevent both cervical cancer and genital warts (Schnatz et al., 2010). Including males in the vaccination process also can reduce HPV related cancers among men, prevent genital warts, and reduce the transmission of HPV to uninfected women (Ault, 2008).

Although the studies reviewed here yield valuable information about healthcare providers in general, there were no studies assessing *school nurses* and their views of the HPV vaccine. This is particularly intriguing, given school nurses' prominent role as healthcare providers for adolescents and school age children. Because school nurses are

viewed as health advocates for children (Bartlett & Peterson, 2011), school nurses have an important role in providing accurate information about HPV and the HPV vaccine, as well as in recommending the vaccine to parents and students (Bartlett & Peterson, 2011; Ehrhardt, 2007). Since the HPV was approved and became widely available, there is a need to monitor the attitudes, beliefs, and behaviors of all populations involved in HPV vaccine acceptance (Zimet et al., 2006), including school nurses.

Limitations

Although this review contributes to the literature by synthesizing research on healthcare providers' knowledge, attitudes, perceptions, intentions and practices related to the HPV vaccine, it has limitations that must be considered. First, this review excluded qualitative research regarding the HPV vaccine. The purpose of this review was to summarize and describe the results of empirical quantitative studies assessing healthcare providers' knowledge, attitudes, and/or professional practice. Quantitative studies utilizing inferential statistics allow for generalizability in understanding healthcare providers' knowledge, attitudes, perceptions, intentions and professional practice towards the HPV vaccine in youth. Future reviews could include qualitative as well as quantitative studies to provide a richer assessment and specific cases regarding this issue.

In addition, this study excluded research conducted in countries other than the US. Although examining studies conducted in other countries would have limited the generalizability of the findings in this review, future reviews could synthesize the variability in the HPV vaccine uptake across countries (Kessels et al., 2012). In this

review, we chose to focus exclusively on American healthcare providers, which allowed us to understand the issue from a single cultural perspective.

Despite these limitations, this review provides the first study examining and organizing literature exclusively focusing on healthcare providers regarding the HPV vaccine for youth. Findings identified that healthcare providers are more likely to recommend the HPV vaccine or vaccinate if (a) professional organizations recommend the HPV vaccine, (b) the patient is female and older, and (c) if there are fewer perceived barriers to vaccination. These findings suggest the medical and health promotion professional must rely on a multi-dimensional approach to understanding adolescent vaccine acceptance and increasing vaccination rates (Katz et al., 2010).

CHAPTER IV

SCHOOL NURSES' KNOWLEDGE, ATTITUDES, PERCEPTIONS, AND PROFESSIONAL PRACTICE REGARDING HPV VACCINE FOR YOUTH

Introduction

Since 2006, adolescents in the United States (US) have had an effective means of preventing cervical cancer and genital warts: the human papillomavirus (HPV) vaccine. Despite such effective means, vaccination rates remain low for adolescents. Since the vaccine's approval, 53% of female and 8.3% of male adolescents have been vaccinated with the *first* of three required doses. Yet only 34.8% of teen females have received *all three* recommended doses. Currently, males' three dose vaccination rates are not reported (Centers for Disease Control and Prevention [CDC], 2012a).

One important question, therefore, emerges from this low uptake scenario: What can healthcare providers do to increase the uptake of the HPV vaccine? Although informing parents about the vaccine's benefits is an important factor—research shows parents are concerned about the vaccine's safety, side effects, and potential for increasing sexual activity of adolescents (Bartlett & Peterson, 2011; Herzog et al., 2008; Jenson, 2009; Kessels et al., 2012)—the scientific literature documents healthcare providers' recommendations can lead to positive parental/patient attitudes toward vaccinations and increased vaccination rates (Brewer & Fazekas, 2007; Fisher et al., 2008; Gamble et al., 2010; Garcini et al., 2012; Jenson, 2009; Kessels et al., 2012; Zimet, 2005; Zimet et al., 2006; Zimet, 2006). Healthcare providers, therefore, play an

important role because they can clarify misunderstandings and concerns about the HPV vaccine, as well as influence parents/patients' perspectives (Brewer & Fazekas, 2007; Jenson, 2009; Zimet, 2006).

Even though school nurses are the most readily available healthcare professionals to families with adolescents (Bennett, 2008), there is limited literature exploring school nurses' role regarding the HPV vaccine for youth (see Chapter III). This study, therefore, examines school nurses' knowledge, attitudes, perceptions, and professional practice regarding the HPV vaccine for youth in the US.

School Nurses as Opinion Leaders

As described in Chapter II, the Diffusion of Innovations (DOI) theory is an ideal framework to examine school nurses as opinion leaders regarding the HPV vaccine for youth. Diffusion of innovations is a process “by which (1) an *innovation* (2) is *communicated* through certain *channels* (3) *over time* (4) among the members of a *social system*” (Rogers, 2003, p. 11). Within *social systems*, there are opinion leaders *communicating* with and influencing other members' attitudes and behaviors regarding the *innovation* over a certain *time* period. Opinion leaders are vital to the success or failure of diffusion programs (Rogers, 2003), because opinion leaders communicate with other people and act as influential channels (Green et al., 2009; Valente & Pumpuang, 2007).

School nurses can be considered opinion leaders within the school-community systems because of their unique role as cross-disciplinary professionals and their understanding of the educational and health systems (Baisch et al., 2011; American

Academy of Pediatrics Council on School Health, 2008). Because school nurses are an important element in delivering current healthcare information to students and parents, these professionals have the opportunity to provide appropriate HPV vaccine information and recommendations, thereby allowing parents to make informed decisions regarding the HPV vaccine for their children (Bartlett & Peterson, 2011; Ehrhardt, 2007). Particularly, school nurses can address parents' concerns about necessity, safety, and efficacy to lessen apprehensions about the vaccine (Lockwood-Rayermann & McIntyre, 2009). School nurses are able to connect with a large portion of the population—nearly all school-aged adolescents—thus having the ability to disseminate vital information about cervical cancer prevention (Lockwood-Rayermann & McIntyre, 2009). As a result, school nurses serve as interpersonal communication channels between various educational and medical professionals and parents.

The Model and Research Questions

To understand school nurses' role as opinion leaders, their knowledge and attitudes regarding the HPV vaccine for youth, as opinion leaders affect the diffusion process need to be examined (Rogers, 2003). According to the DOI theory, the *knowledge stage* is when an individual learns of an innovation and understands the innovation's function. The *knowledge stage* then leads to the *persuasion stage*. It is during the *persuasion stage* of the innovation-decision process that school nurses will develop favorable or unfavorable attitudes about the HPV vaccine. School nurses' communication channels, which may include other school nurses, physicians, and clinical nurses, help in developing and shaping these attitudes. The underlying

assumption is that the behavior will follow, after the attitude is formed (Rogers, 2003). For example, if attitude toward the HPV vaccine is favorable, the vaccine will be accepted. However, such direct correlation between behavior and attitude does not always occur, or action does not always match attitude. This inconsistency is known as the KAP-gap (KAP stands for *knowledge, attitude, and practice*; Rogers, 2003).

To date, US school nurses' KAP-gap regarding the HPV vaccine for youth has not been empirically examined (see Chapter III). Furthermore, US school nurses' perceptions of their role as opinion leaders regarding the HPV vaccine have not been assessed. Therefore, we have proposed a model to explain school nurses professional practice regarding the HPV vaccine. The model includes knowledge and attitudes concerning HPV and the HPV vaccine, and school nurses' perceptions of their role as opinion leaders. The model proposes that knowledge impacts attitudes, perceptions, and professional practice. Additionally, the model suggests attitudes influence perceptions and professional practice, and that perceptions affect professional practice. These relationships are displayed in Figure 4.1.

In this study, we report on a survey designed to answer: (1) what are US school nurses' knowledge, attitudes, perceptions of their role as opinion leaders, and professional practice regarding HPV vaccine for youth, (2) and do knowledge, attitudes, and perceptions of being an opinion leader influence US school nurses' professional practice regarding the HPV vaccine for youth?

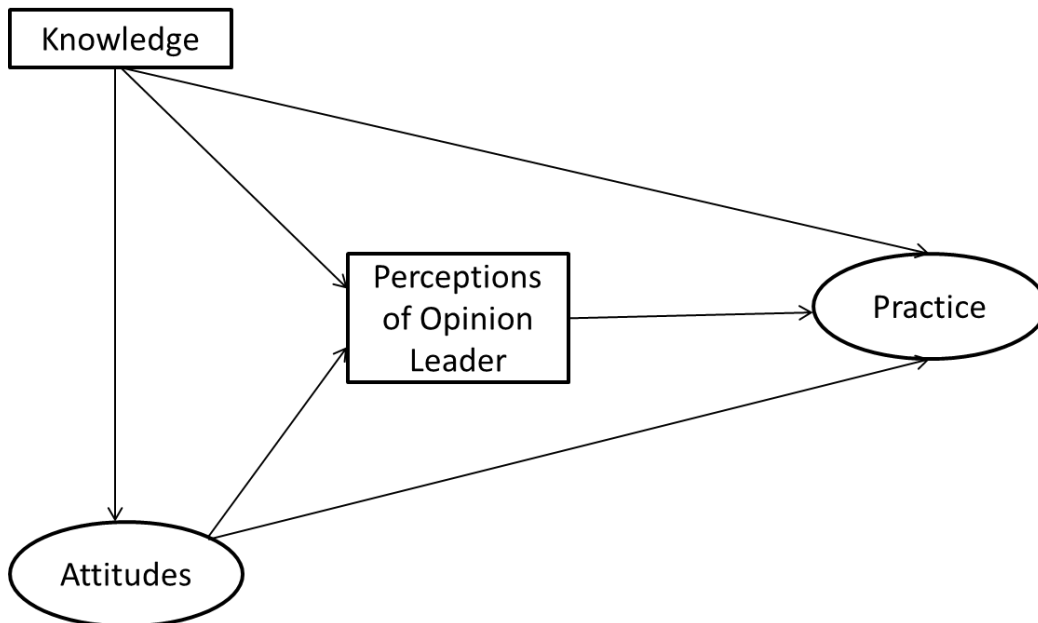


Figure 4.1. Proposed model for the relationships among school nurses' knowledge, attitudes, perceptions of their role as opinion leaders, and professional practice regarding HPV vaccine for youth in the US.

Methods

Sample Selection and Size

To draw from a wide geographic area, we utilized the National Association of School Nurses' (NASN) member database, comprising of an estimated 15,000 members. Members of the NASN are school nurses practicing in various school settings in both public and private schools. A minimum of 378 participants' completed online surveys were needed for statistical inference based on the 15,000 members in NASN. This minimum number was derived taking into account a 95% confidence level with a 5% sampling error and a 50/50 split (i.e., a varied distribution of the effects among the population; Salant & Dillman, 1994). Because online survey response rates vary between

27% and 56% (Cook, Heath & Thompson, 2000; Kittleson, 1997; Kittleson & Brown, 2005), approximately 1,375 NASN members were recruited (taking into account the conservative estimate of 27% response rate). An extra 400 members were sampled to account for any returned or undeliverable email addresses or if a participant acknowledged no longer being a school nurse (68 of these were included in the final sample). Thus, the NASN systematically sampled 1,775 members (e.g., participants selected by every *n*th number) from their database using IMPak (Integrated Software Solutions, Inc.), and a total of 1,443 school nurses were invited to participate, with the final sample size including 505 participants.

Measures

An online survey instrument was designed to measure: demographic characteristics, knowledge of HPV and of the HPV *vaccine*, attitudes regarding HPV and the HPV *vaccine*, perceptions concerning school nurses' role as opinion leaders for the HPV *vaccine*, school nurses' professional practice in providing education/resources about the HPV *vaccine*, and school districts' support in providing health education in general. Three experts in health promotion and three school health experts/school nurses reviewed the items to assess construct relevance, content accuracy, technical flaws, grammar, offensiveness and readability (DeVellis, 2003). Four people, who were graduate students in health education and school professionals, assisted by participating in cognitive interviews and provided feedback for all the items (Dillman, 2007). See Appendix A for the instrument.

Demographic Characteristics. Participant characteristics were obtained and assessed using items related to gender, race/ethnicity, role within the school, school setting, and grade level currently serving. Additionally geographic population, age, years working as a nurse, years working in the school environment, number of students the participant currently serves, and number of school buildings currently served were assessed.

Knowledge Index. To assess if school nurses were familiar with basic knowledge concerning HPV and its vaccine, a knowledge index with 14 multiple choice items was created, based on the CDC and the National Institutes of Health (NIH) websites' on HPV and HPV vaccination information and guidelines (CDC, 2013c; National Cancer Institute, 2011). Participants' scores were measured through counting the number of correct responses (range 0-14) and, in our sample, exhibited a Cronbach's alpha of 0.61. A higher score meant higher knowledge of HPV and the vaccine. HPV knowledge included items on prevalence, symptoms, and transmission. HPV vaccine knowledge items included vaccination population, administration, protection, and vaccination types. To see the table of item specifications for the knowledge index refer to Table 4.1.

Table 4.1
Item Specifications for Knowledge Index

Constructs	Percent of Knowledge Items per Construct
HPV Prevalence	14%
HPV Health Symptoms	22%
HPV Spread	7%
HPV Vaccine Population	22%
HPV Vaccine Administration	14%
HPV Vaccine Protection	7%
HPV Vaccine Types	14%
TOTAL	100%

Attitudes. This variable is a latent variable in the proposed model with two sub-scales measuring attitudes towards (1) HPV and (2) the HPV *vaccine*. Responses for these sub-scales comprised a four-point Likert rating (1 = *strongly disagree*, 4 = *strongly agree*). Similar to the knowledge items, the attitude items were created based on the CDC and the NIH websites' HPV and HPV vaccination information and guidelines. We also anchored the items on the Theory of Planned Behavior (Montano & Kasprzyk, 2008), which states attitudes are formed by the linear combination of beliefs and values. Belief items had a corresponding value item and pairs of items were linearly combined (i.e., attitudes were formed by the sum of belief items multiplied by their respective value items) to measure participants' attitudes.

HPV Sub-scale. This sub-scale contained three items measuring school nurses' attitudes towards the health risks of HPV. A Cronbach's alpha of 0.64 was obtained for this scale. Higher scores indicated attitudes of viewing HPV as causing serious health issues.

HPV Vaccine Sub-scale. This sub-scale contained 11 items assessing school nurses' attitudes towards the HPV vaccine's safety and efficacy, and the population that should be receiving the HPV vaccine. The reliability level (Cronbach's alpha) for this sub-scale was 0.92. Higher scores indicated positive attitudes towards the HPV vaccine.

Perceptions. This scale was also created for this study and based on the DOI's construct of opinion leaders (Rogers, 2003). This scale comprised three items that produced a Cronbach's alpha of 0.82. An example of the scale's item is "*I currently see myself as a leader in providing HPV vaccine information in the school community.*" Responses fell on four-point Likert scale (1 = *strongly disagree*, 4 = *strongly agree*), with higher scores indicating stronger perceptions of being an opinion leader. As with the attitudes scale, a linear combination of belief and value items were used in creating this scale.

Professional Practice. This is also a latent variable consisting of two sub-scales: (1) providing HPV vaccine resources and information to parents and students, and (2) school district support for school nurses providing health education.

Providing HPV Vaccine Information and Resources to Parents and Students Sub-Scale. This sub-scale comprised of seven items, specifically created for this study, and yielded a Cronbach's alpha of 0.90. Items measured school nurses' professional practice of providing information and resources about the HPV vaccine to parents and students. Participants had a 4-point scale for response options, anchored by 1 (*never*) and 4 (*always*). Participants had a fifth response option of "policies in the school district/campus I work in/at do not allow this." This fifth response option was treated as

missing data in the model. Higher scores indicated engaging in more professional practice providing information and resources about the HPV vaccine to parents and students.

School District Support for School Nurses Providing Health Education. This sub-scale contained four items assessing school districts' support of school nurses providing health education (in general, not specifically related to HPV). The scale exhibited a Cronbach's alpha of 0.89. The items were scored on a 4-point Likert scale (1 = *strongly disagree*, 4 = *strongly agree*). Therefore, higher scores denoted higher levels of district support for health education provided by the school nurse.

Data Collection

The instrument questions were entered into Qualtrics, an online software program provided by Texas A&M University to faculty, staff, and students, for administering online surveys. Qualtrics generated a link to the survey, which was sent via email along with a description of the study to participants during January 2013. The email's subject line was left blank, because research suggests that emails not stating the reason or the sponsor of the email are more likely to be opened by participants (Porter & Whitcomb, 2005). The survey was distributed through a mail merge option three separate times (the initial email followed by two email reminders) in a two-week period. The first email reminder was sent one week after the initial survey email, and the second email reminder was sent two weeks after the initial survey email.

Qualtrics has an "authenticator" option, which requires participants to log in with their email address to avoid data duplication. Qualtrics also allows for survey items to be

randomized within the survey to reduce the chance of a response set. Both the authenticator option and randomization of items were utilized in this study. A random drawing of 20 email addresses—provided by the participants—for receiving a \$50 Wal-Mart gift card was used to provide incentives for the participants. Using monetary incentives has been shown to increase the likelihood of participation in online surveys and may improve the quality of participants' responses (Görizt, 2010). This study and the instrument were reviewed and approved by Texas A&M University Institutional Review Board (IRB) and by the National Association of School Nurses.

Data Analysis

A total of 505 participants responded to the survey, yielding a response rate of 34.9%. The final dataset, however, had cases with missing data. Cases were deleted if there were missing data for more than three items. If only three or fewer items were missing, average scores were imputed. Data analyses were conducted with cases that had no missing data, exclusively, yielding a final sample size of 413 (response rate 28.6%).

Descriptive statistics and frequencies were conducted to analyze participant characteristics' data. Analysis of Variance (ANOVA) was used to examine zero-order differences between three nominally-scaled demographic variables—geographic area, grade level currently serving, and race/ethnicity with a cutoff of $\alpha = 0.05$. Pearson's r correlation was conducted for the demographic variable of years working in a school environment as a nurse, which was a continuous variable with a cutoff of $\alpha = 0.05$. Effect sizes were computed and reported for all mean differences. Because there was

such a large group of respondents identifying as White in race/ethnicity (95.9%), this variable was further dichotomized as White and non-White in the analyses.

An exploratory factor analysis (EFA) with the attitudes, perceptions, and professional practice scales, allowed assessing these scales' factor structure and whether the scales exhibited internal consistency. Additionally, the proposed model was examined through structural equation modeling (SEM) techniques because of its ability to examine the adequacy of theorized models. Model fit was evaluated with the comparative fit index (CFI), incremental fit index (IFI), and root mean square error of approximation (RMSEA), with a 90% confidence interval (Browne & Cudeck, 1993; Hu & Bentler, 1998). Direct and indirect effects were also analyzed. All analyses were run in PASW Statistics 18.0 and Amos 5 (SPSS Inc., 2007; SPSS Inc., 2010).

Results

Demographic Characteristics

Participants in this study were, on average, 51 years old ($SD = 8.7$), ranging between 25 and 74. The item assessing the number of years working as a nurse had a mean of 26.4 ($SD = 9.9$), and years in the school environment as a nurse had a mean of 11.7 ($SD = 7.5$). The majority of participants were female ($n = 409, 99.0\%$), White ($n = 396, 95.9\%$), registered nurses (RN; $n = 384, 93.0\%$), and working in a *public* school ($n = 373, 90.3\%$). Nearly half of the sample identified working in a rural area ($n = 203, 49.2\%$), and were currently serving grade levels 9th-12th ($n = 204, 49.4\%$), followed by 6th-8th ($n = 114, 27.6\%$), and Pre-Kindergarten (PreK)-5th ($n = 95, 23.0\%$). Tables 4.2 and 4.3 provide additional participants' characteristics.

Table 4.2
Study Participant Characteristics on Continuous Variables (n = 413)

Variable	<i>M</i>	<i>SD</i>
Age	51.1	8.76
Years as a Nurse	26.4	9.9
Years in the School Environment as a Nurse	11.7	7.5
Number of Students Currently Serving	2,359.9	9,647.9
Number of School Buildings Currently Serving	3.9	8.2

Table 4.3
Study Participant Characteristics on Non-Continuous Variables (n = 413)

Variable	n	%
Gender (n = 413)		
Female	409	99.0
Male	4	1.0
Race/ethnicity (n = 413)		
White	396	95.9
Black or African American	7	1.7
Hispanic or Latino	6	1.5
American Indian or Alaska Native	3	0.7
Asian	1	0.2
Native Hawaiian or other Pacific Islander	0	0.0
Role within School (n =413)		
Registered nurse (RN)	384	93.0
Registered nurse practitioner	10	2.4
Practical nurse (LPN)	6	1.5
Retired	6	1.5
Other	5	1.2
Vocational nurse (LVN)	2	0.5
Nurse's assistant	0	0.0
Geographic Area Population (n = 413)		
Rural (≤ 100,000 people)	203	49.2
Urban (<500,000 and > 100,000 people)	144	34.9
Metropolitan (≥ 500,000 people)	66	16.0
School Setting (n=413)		
Public	373	90.3
Private	17	4.1
Other	14	3.4
Charter	5	1.2
Parochial	4	1.0
Grade Levels Currently Serving (n = 413)		
9 th -12 th grade	204	49.4
6 th -8 th grade	114	27.6
PreK-5 th grade	95	23.0

Research Questions

Research Question 1: What are US school nurses' knowledge, attitudes, perceptions of their role as opinion leaders, and professional practice regarding the HPV vaccine for youth?

Knowledge. The mean score for the knowledge scale was 10.0 ($SD = 2.4$) with scores ranging between 2-14 with the maximum possible score being 14, suggesting that school nurses have some knowledge of HPV and the vaccine. The main item that received the most incorrect responses was “At least ___ of sexually active people have been infected with HPV at some point in their lives” with only 38% of participants providing the correct response of 50%.

Based on the knowledge scale, an ANOVA revealed a statistically significant difference for participants serving 9th-12th grades ($M = 10.3, SD = 2.3$) when compared to participants serving PreK-5th grades ($M = 9.3, SD = 2.5$); knowledge scores from school nurses serving 9th-12th grades were higher ($F [2, 410] = 5.0, p = .007, \eta^2 = 2.4\%$). Additionally, based on race and ethnicity, White participants scored significantly higher on knowledge ($M = 10.0, SD = 2.3$), compared to non-White participants ($M = 8.5, SD = 2.8, F [1, 411] = 7.5, p = .007, \eta^2 = 1.9\%$).

Attitudes. Participants' attitudes towards the HPV vaccine were, mostly, positive with a scale mean of 122.0 ($SD = 27.6$) and ranging between 53-176. All but one item in the HPV vaccine sub-scale had a mean above 10.00, and individual items had a range from 1-16. The one item scoring lower than all others regarded the HPV vaccine being on the market long enough to be considered safe ($M = 8.7, SD = 2.6$). An ANOVA

showed school nurses working in a metropolitan area had more positive attitudes towards the HPV vaccine ($M = 130.2, SD = 25.7$) than participants working in a rural area ($M = 120.4, SD = 28.0, F [2, 410] = 3.5, p = .03, \eta^2 = 1.7\%$).

Participants were more “middle-of-the-road” about HPV. The mean score for the item was 26.6 ($SD = 9.0$), with scores ranging from 9-48. Race/ethnicity differences in scoring were statistically significant, with White participants reporting that HPV was considered serious in terms of causing health issues more than non-White participants ($M_{White} = 26.8, SD = 9.0; M_{non-White} = 22.3, SD = 7.3, F [1, 411] = 4.0, p = .05, \eta^2 = 1.0\%$).

Perceptions of Role as Opinion Leaders. On average, school nurses in our study scored slightly above the conceptual mid-point of the scale (ranging from 8–48; $M = 26.5, SD = 8.4$). These scores indicate less-than-enthusiastic perceptions of their role as opinion leaders regarding the HPV vaccine. When comparing sub-groups of participants through ANOVA, scores on the factor “perceptions of role as opinion leader for the vaccine” exhibited statistically significant differences for geographic area, grade level, and years working in the school environment. Participants working in a metropolitan area (population of 500,000 people or more) had stronger perceptions of being an opinion leader for the HPV vaccine ($M = 28.7, SD = 9.0$) than participants working in an urban area (population between 100,000 and 500,000 people; $M = 25.9, SD = 7.5, F [2, 410] = 3.1, p = 0.05, \eta^2 = 1.5\%$). However, there was no difference between school nurses working in rural areas when compared to school nurses working in urban and metropolitan areas. School nurses who were currently working with

students in 9th-12th grades had stronger perceptions of being an opinion leader ($M = 27.5$, $SD = 8.9$) when compared to those working with students in PreK-5th grades ($M = 24.1$, $SD = 7.0$, $F [2, 410] = 5.3$, $p = 0.005$, $\eta^2 = 2.5\%$). Furthermore, we examined whether the variable “years working in the school environment” was correlated with “perceptions of being an opinion leader” by running a Pearson r . The association was statistically significant, but small ($p = 0.02$, $r = 0.12$); the longer a school nurse worked in the school environment the stronger his/her perceptions were of being an opinion leader.

Professional Practice. Overall, school nurses in our study reported few professional practice activities related to providing information and resources about the HPV vaccine, with a mean scale score of 11.7 ($SD = 4.8$; scale range of 7-28). However, participants had a higher score for the sub-scale “district support” ($M = 12.6$, $SD = 1.9$; scale range of 5-16).

When exploring possible sub-group variation in professional practice of providing resources—such as those related to demographic variables—differences were statistically significant for grade level currently serving, race/ethnicity, and years working in the school environment. An ANOVA was computed and showed school nurses serving 9th-12th grades were providing more information and resources ($M = 13.3$, $SD = 5.3$) than those serving 6th-8th grades ($M = 11.0$, $SD = 4.0$, $p = 0.00$), or PreK-5th grades ($M = 9.2$, $SD = 3.1$, $F [2, 388] = 28.0$, $p < 0.001$, $\eta^2 = 12.6\%$). The difference between scores from school nurses serving 6th-8th grades and those serving PreK-5th grades was also statistically significant ($p = 0.02$). Regarding race/ethnicity, non-White

participants reported engaging in providing information and resources about the HPV vaccine more frequently than White participants ($M_{White} = 14.6, SD = 5.8; M_{non-White} = 11.6, SD = 4.7, F [1, 411] = 5.9, p = 0.02, \eta^2 = 1.5\%$). Years working in the school environment was positively correlated (albeit a weak relationship) with providing information and resources for HPV vaccine ($p = 0.001, r = 0.17$). No statistically significant differences were observed regarding demographic variables and district support for nurses' professional practice. Tables 4.4 through 4.6 provides the ANOVA results for each of the demographic variables (geographic population, grade level currently serving, and race/ethnicity), while Table 4.7 provides the Pearson's r results for "years working in the school environment" variable. Table 4.8 provides the means and standard deviations for total scale scores and the Cronbach's alpha for each scale. To see the means and standard deviations for all individual items in the scales please see Appendix B through Appendix E.

Table 4.4
ANOVA Results for Knowledge, Attitudes, Perceptions, and Professional Practice by Geographic Population

	Metropolitan	Urban	Rural	<i>F</i>	η^2
Knowledge	9.8 (1.9)	9.7 (2.6)	10.2 (2.3)	2.1	1.0%
Attitudes					
HPV	26.7 (9.7)	26.2 (8.6)	26.8 (9.2)	0.2	0.0%
Vaccine	130.2 _a (25.7)	120.6 (27.4)	120.4 _a (28.0)	3.5*	1.7%
Perceptions	28.7 _a (9.0)	25.9 _a (7.5)	26.2 (8.7)	3.1*	1.5%
Practice					
Resources	11.5 (5.4)	11.2 (4.4)	12.1 (4.9)	1.6	0.8%
School District Support	12.6 (1.8)	12.6 (1.9)	12.7 (1.9)	0.1	0.0%

Note. * = $p \leq 0.05$, ** = $p \leq 0.01$. Standard Deviations are presented in parenthesis below means. Means with differing subscripts within rows are statistically significantly different based on Tukey HSD post hoc tests.

Table 4.5
*ANOVA Results for Knowledge, Attitudes, Perceptions, and Professional Practice by Grade Level
 Currently Serving*

	9 th -12 th grade	6 th -8 th grade	PreK-5 th grade	<i>F</i>	η^2
Knowledge	10.3 _a (2.3)	10.0 (2.3)	9.3 _a (2.5)	5.0*	2.4%
Attitudes					
HPV	27.0 (9.3)	26.4 (8.5)	26.0 (9.0)	0.5	0.2%
Vaccine	123.2 (27.6)	122.5 (28.2)	118.9 (26.9)	0.8	0.4%
Perceptions	27.5 _a (8.9)	26.7 (8.2)	24.1 _a (7.0)	5.3**	2.5%
Practice					
Resources	13.3 _{ab} (5.3)	11.0 _{ac} (4.0)	9.2 _{bc} (3.1)	28.0**	12.6%
School District Support	12.8 (1.9)	12.3 (1.6)	12.8 (2.0)	2.9	1.4%

Note. * = $p \leq 0.05$, ** = $p \leq 0.01$. Standard Deviations are presented in parenthesis below means. Means with differing subscripts within rows are statistically significantly different based on Tukey HSD post hoc tests.

Table 4.6
ANOVA Results for Knowledge, Attitudes, Perceptions, and Professional Practice by Race/Ethnicity

	White	Non-White	<i>F</i>	η^2
Knowledge	10.0 (2.3)	8.5 (2.8)	7.5**	1.8%
Attitudes				
HPV	26.8 (9.0)	22.3 (7.3)	0.05	1.0%
Vaccine	122.0 (27.6)	123.5 (29.4)	4.0*	0.0%
Perceptions	26.4 (8.3)	28.4 (10.5)	1.0	0.2%
Practice				
Resources	11.6 (4.7)	14.6 (5.8)	5.9*	1.5%
School District Support	12.6 (1.9)	12.8 (1.6)	0.2	0.0%

Note. * = $p \leq 0.05$, ** = $p \leq 0.01$. Standard Deviations are presented in parenthesis below means.

Table 4.7
*Pearson's r Correlation for Knowledge, Attitudes, Perceptions, and Professional Practice by
 Years Working in a School Environment*

	<i>r</i>	<i>p</i>
Knowledge	-0.07	0.16
Attitudes		
HPV	-0.03	0.61
Vaccine	0.07	0.18
Perceptions	0.12*	0.02
Practice		
Resources	0.17**	0.001
School District Support	0.07	0.17

Note. * = $p \leq 0.05$, ** = $p \leq 0.01$.

Table 4.8
Scale Scores and Reliability Statistic

Scales	<i>M</i>	<i>SD</i>	Cronbach's α
Knowledge (14 items)	10.0	2.4	.61
Vaccine (11 items)	122.0	27.6	.92
HPV (3 items)	26.6	9.0	.64
Perceptions (3 items)	26.5	8.4	.82
Resources (7 items)	11.7	4.8	.90
Support (4 items)	12.6	1.9	.89

Research Question 2: Do knowledge, attitudes, and perceptions of being an opinion leader influence US school nurses' professional practice regarding the HPV vaccine for youth?

Structural equation modeling analyses examined the proposed model (see Figure 4.1), hypothesizing relationships among knowledge, attitudes, perceptions of role as opinion leader, and professional practice regarding the HPV vaccine. This model suggested knowledge impacts attitudes, perceptions, and professional practice. Additionally, this model proposed attitudes influence perceptions and professional practice, and that perceptions affect professional practice. Knowledge, attitudes, and perceptions had direct paths to professional practice, but knowledge and attitudes also had an indirect path to professional practice through perceptions.

The first run of the proposed model resulted in a χ^2 of 17.084 (N = 413, df = 6, p = 0.009), indicating a potentially good fit. Moreover, the analyses yielded a CFI = .979, IFI = .979 and RMSEA = .067 (90% CI [0.031-0.105]). Together, these results (the χ^2 , CFI, IFI and RMSEA) suggested the model fit the data adequately, with both CFI and IFI revealing a good model fit (Browne & Cudeck, 1993; Hu & Bentler, 1998). All paths were statistically significant *except* for the knowledge to perceptions path ($p = .25$) and the knowledge to practice path ($p = .18$; see Figure 4.2).

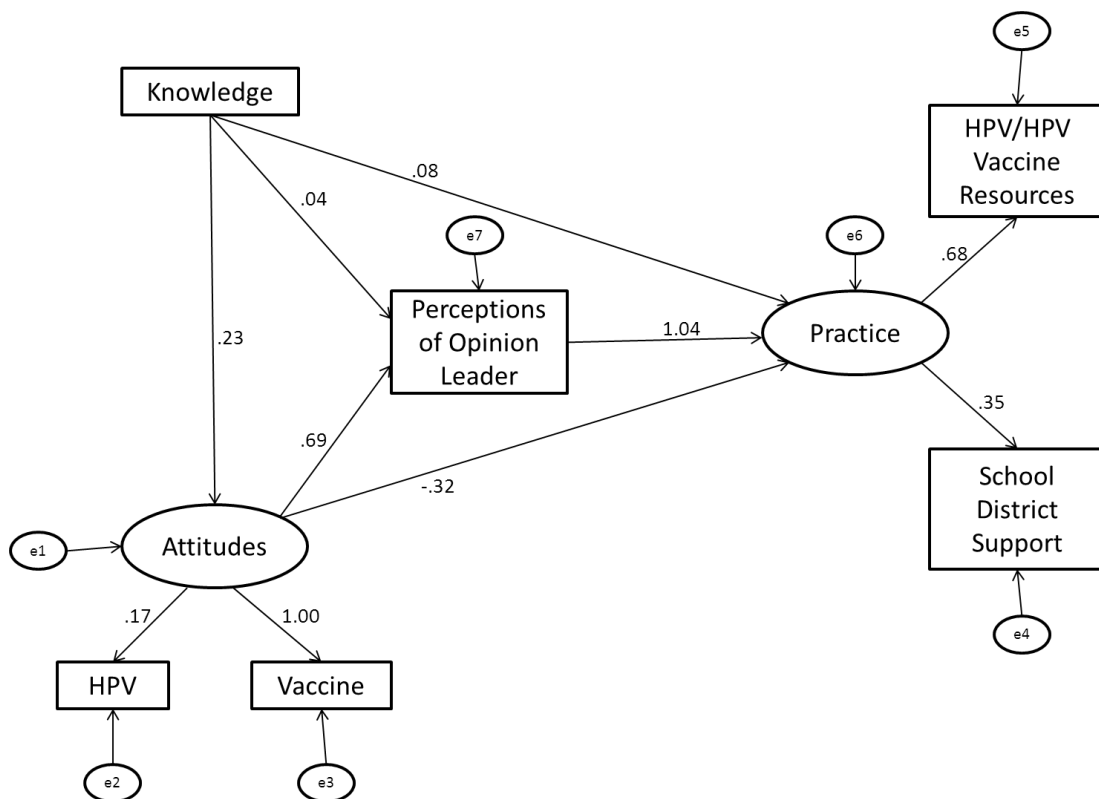


Figure 4.2. Proposed model for school nurses’ knowledge, attitudes, perceptions of role as opinion leader impact of professional practice regarding HPV vaccine for youth with standardized regression weights.

The proposed model was then modified, after examining the standardized regression weights and modification indices, by removing the knowledge-to-perceptions and the knowledge-to-practice paths (see Figure 4.3). This modified model produced the following results: $\chi^2 = 20.238$ (N = 413, df = 8, p = 0.009), CFI = 0.977, IFI = 0.977 and RMSEA = 0.061 (90% CI [0.028, 0.095]). Again, these results indicated good model fit and all paths exhibited a statistically significant coefficient.

In testing the proposed model, we were particularly interested in the role of the “perceptions” variable as a mediator. There are four steps that must be completed (in

SEM) to establish *full mediation* (Baron & Kenny, 1986; Holmbeck, 1997): (1) attitudes must affect/relate to practice, (2) attitudes must affect/relate to perceptions, (3) perceptions must affect/relate to practice, and (4) attitudes' relationship with practice, when the perceptions variable is in the model, must be zero. However, when the coefficient for the attitude-to-practice path is substantially reduced after including perceptions in the model (but does not equal zero), *partial mediation* occurs (Kenny, 2013).

Therefore, we ran a third model to examine these four steps. First, the factor "perceptions" was removed (see Figure 4.4), and revealed a standardized regression weight from attitudes-to-practice of 0.54 ($p < 0.05$). When adding perceptions to the model, the standardized regression weight from attitudes-to-practice was reduced to -0.30 ($p < 0.05$), indicating that perceptions is a partial mediator in the modified model. Furthermore, the standardized regression weight for attitudes-to-perceptions was 0.70 ($p < 0.05$) and perceptions-to-practice was 1.06 ($p < 0.05$). Standardized indirect effects for the path from attitudes-to-practice equaled 0.739 ($p < 0.001$). Thus, the net impact of perceptions as a mediating variable is positive and exerts a stronger indirect effect upon practice than a direct effect.

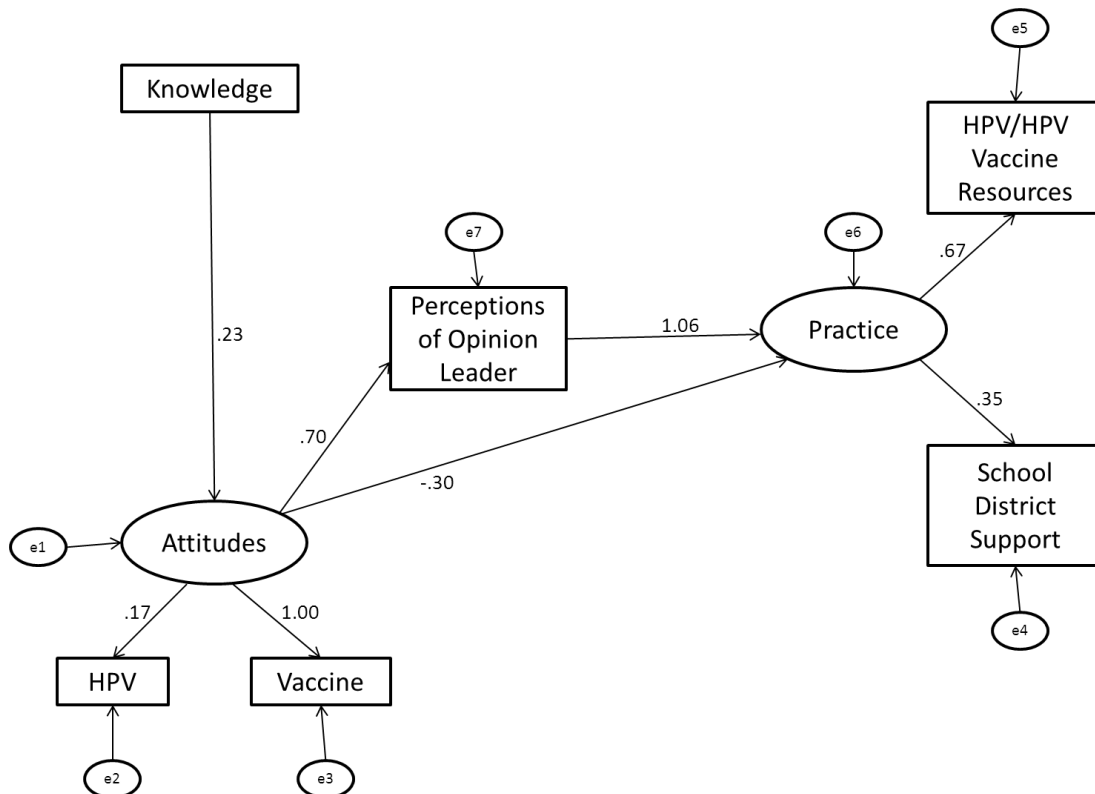


Figure 4.3. Modified model for school nurses' knowledge, attitudes, perceptions of role as opinion leader impact of professional practice regarding HPV vaccine for youth with knowledge paths removed from perceptions and practice and standardized regression weights.

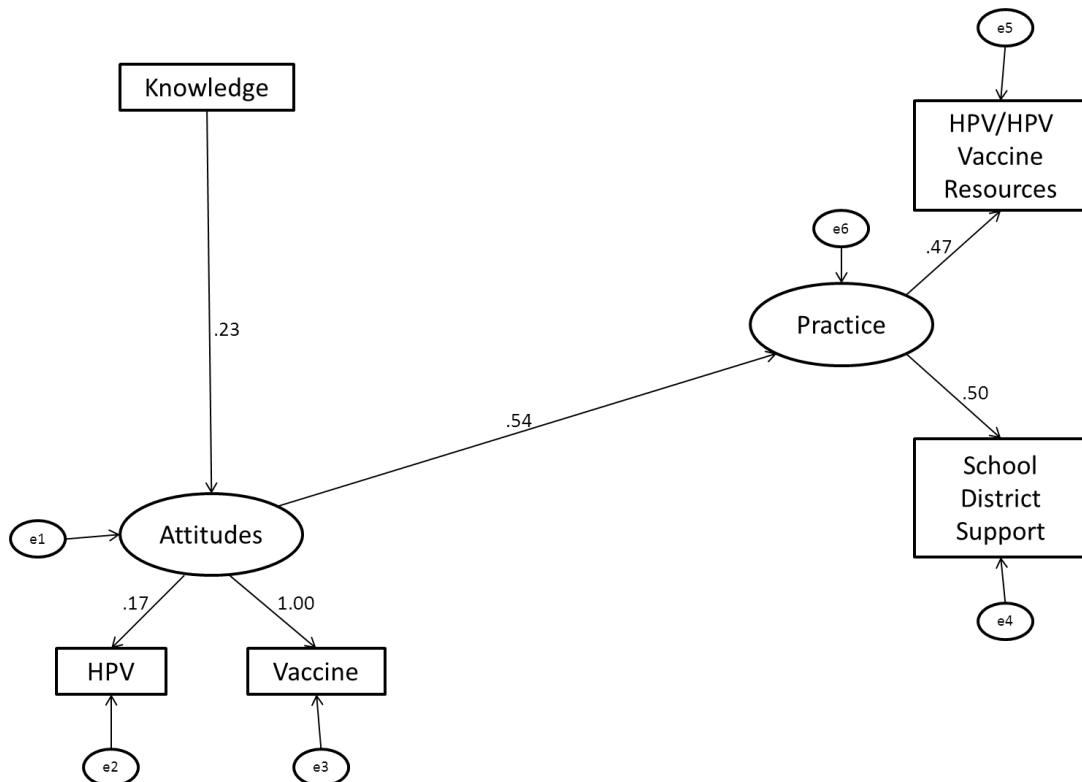


Figure 4.4. Modified model for school nurses' knowledge, attitudes, and professional practice regarding HPV vaccine for youth with standardized regression weights.

Discussion

The purpose of this study was twofold: (1) to determine and qualify school nurses' knowledge, attitudes, perceptions of their role as an opinion leader, and professional practice regarding the HPV vaccine for youth, and (2) to examine if knowledge, attitudes, and perceptions of their role as opinion leaders impact professional practice regarding this vaccine for youth. To our knowledge, this is the first study to examine school nurses' cognitions and professional practice regarding HPV vaccine for youth in the US. Results from this study suggest school nurses have moderate knowledge regarding HPV and the HPV vaccine and mostly positive attitudes towards the HPV vaccine. School nurses' perceptions regarding their role as opinion leaders lacked strength, and their professional practice regarding the HPV vaccine for youth were infrequent.

Communication with parents and adolescents about the HPV vaccine is a critical component for increasing vaccination rates, and school nurses have a vital role in educating parents, students, and the community about receiving the HPV vaccine (Bartlett & Peterson, 2011; Ehrhardt, 2007). School nurses are particularly critical in the delivery of current health information, specifically information about the necessity, safety, and efficacy of vaccines (Lockwood-Rayermann & McIntyre, 2009). Furthermore, school nurses are the most common health services provider in the schools (Brener, Wheeler, Wolfe, Vernon-Smiley, & Caldart-Olson, 2007); they function as healthcare liaisons between students, school faculty and staff, families, healthcare

professionals, and the community (American Academy of Pediatrics Council on School Health, 2008).

Utilizing school nurses as opinion leaders to communicate information about the HPV vaccine could be an effective strategy in increasing HPV vaccination rates. School nurses have access to nearly all adolescents and in turn can have a profound impact on disseminating accurate information about the HPV vaccine (Lockwood-Rayermann & McIntyre, 2009). However, school nurses will be less-than-effective in disseminating the vaccine, if they do not consider themselves opinion leaders.

Overall, in this study school nurses appeared to have less-than-enthusiastic views of their role as opinion leaders regarding the HPV vaccine, shown in Table 4.8 with mean score of 26.5 out of 48. Despite their moderate perceptions, our analysis, as reflected in Figure 4.3 and 4.4, indicated an important mediating role for perceptions, shaping the relationship between school nurses' attitudes and professional practice as the standardized regression weight decreased from 0.54 to -0.30 when perceptions was included in the model. Our results, in Figure 4.3, clearly indicate that a school nurse's attitudes about HPV and the HPV vaccine affect the perceptions of his/her role as an opinion leader, which, in turn, influences professional practice. Although school nurses are considered leaders in advocating and providing health services by others in the social system (American Academy of Pediatrics Council on School Health, 2008; Bartlett & Peterson, 2011; Lockwood-Rayermann & McIntyre, 2009), if they do not see themselves as opinion leaders regarding the HPV vaccine, then the diffusion of the HPV vaccine will take longer to occur.

In the past, the KAP surveys, used to explain a behavior in the DOI theory, have contributed to a better understanding of human behavior change (Rogers, 1973), hence the name *KAP-gap*. These past surveys showed that knowledge and attitude change is more attainable than adoption of a new practice (or behavior; Rogers, 2003). However, based on the results of this study we can see how the partial mediation, seen in Figure 4.3 and 4.4, of perceptions of being an opinion leader clarifies some of the inconsistencies found among studies examining knowledge, attitudes and practice. This partial mediation is important when examining the relationship between attitudes and professional practice because perceptions of being an opinion leader provides an explanation of why school nurses might have high knowledge, and positive attitudes towards the HPV vaccine but low levels of professional practice (or provision of the vaccine and information). Therefore, by including a perceptions construct into KAP, we may be able to understand the past discrepancies between high knowledge, positive attitudes, and low practice.

Another notable finding, in Figure 4.2, was that knowledge of HPV and the HPV vaccine *did not influence* perceptions of being an opinion leader nor professional practice regarding the HPV vaccine, which was reflected in the standardized regression weights. Conversely, some of the professional literature suggests that school nurses need more education about HPV and the HPV vaccine to promote and provide HPV vaccine information to parents and students (Ehrhardt, 2007; Lockwood-Rayermann & McIntyre, 2009). While it is important that school nurses have correct information and knowledge of HPV and the HPV vaccine to provide to clients, this study revealed that more knowledge does not lead to stronger perceptions of being an opinion leader regarding the

HPV vaccine. Furthermore, higher knowledge levels were not *directly* related to providing parents and students with HPV vaccine information. This finding was consistent with another study focusing on healthcare providers showing there was no association between self-reported HPV knowledge and administering the HPV vaccine (Schnatz et al., 2010). Contradicting results showed healthcare providers' HPV knowledge was associated with recommending and/or providing HPV vaccine (Kahn et al., 2009; Leddy et al., 2009). Knowledge of HPV and the HPV *vaccine* did, however, relate to attitudes as seen in Figure 4.2 with a standardized regression weight of 0.23. Therefore, having more knowledge of HPV and the HPV *vaccine* might be an important precursor for more positive attitudes towards the HPV vaccine.

The last notable findings from this study were the differences found among various demographic variables. School nurses working in a metropolitan area (population of 500,000 people or more) and more years in the school environment reported stronger perceptions of being an opinion leader than school nurses working in an urban area (population between 100,000 and 500,000 people) and fewer years in a school environment, as reflected by the *F*-value of 3.1 and *r* of 0.12 in Table 4.4 and Table 4.7, *respectively*. These results could potentially be explained by having more experience in serving more students—whether in a certain area or over time—and providing more education about health issues, thereby having stronger perceptions of being an opinion leader. Furthermore, this study found school nurses serving grades 9th-12th reported the highest levels of perceptions of themselves as opinion leaders and highest frequencies of professional practice as reflected by the *F*-value of 5.3 and 28.0,

respectively, in Table 4.5. These findings are consistent with results from a systematic literature review documenting that healthcare providers were more likely to recommend and provide the HPV vaccine to older adolescent patients than younger ones (Chapter III). The CDC recommends 11-12 year old boys and girls receive the HPV vaccine (CDC, 2013c), but with school nurses and healthcare providers offering information and recommendations mostly to older adolescents, there are missed opportunities to increase the HPV vaccination rates before sexual activity begins and when immune response is greatest (Ehrhardt, 2007).

Based on these findings, when creating interventions to increase school nurses' provision of HPV vaccine information, program developers need to focus more attention on increasing positive attitudes towards the HPV vaccine, and on school nurses' perceptions of their role as opinion leaders for the HPV vaccine. While knowledge might be increased to assist in forming positive attitudes, increasing knowledge should not be the main focus of these programs. Additionally, school nurses serving all grade levels should be included in the interventions to encourage dissemination of positive attitudes among nurses serving younger adolescents.

To our knowledge, this is the first nationally representative study of US school nurses' knowledge, attitudes, perceptions of their role as opinion leaders, and professional practice regarding the HPV vaccine for youth. There are noteworthy strengths in this study. First, our study population comprised the members of the National Association of School Nurses, enhancing the generalizability of findings from our sample to US school nurses, nationally. Second, the survey instrument focused

specifically on the HPV vaccine, thereby allowing greater insight into school nurses' views and professional practice regarding this vaccine. Third, by utilizing a robust multivariate analysis (SEM), we were able to create a model that allowed us to better understand which factors impact school nurses' professional practice regarding the HPV vaccine. This, in turn, will allow for improving interventions and programs to help increase the HPV vaccine uptake among school-based youth.

Although this study had several strengths, specific limitations need to be considered when interpreting the results. First, participants were selected through systematic sampling (e.g., participants selected by every n th number) from the NASN database, thus the sample was not selected by true random sampling. Although this strategy allows for systematic bias to occur, the authors had no control over the required sampling strategy employed by the NASN. Second, while the response rate was decent for online surveys (34.9%), it may represent an underestimate of the true response rate, and such underestimation can be due to various factors—such as spam filters—preventing potential participants from receiving the emailed survey link. This study's response rate may decrease the results' generalizability to school nurses due to nonresponse bias. Finally, the data were self-reported; therefore we did not *observe* school nurses' professional practice. Self-reported data have the potential for recall biases and responses that are socially-desirable. In an effort to minimize the latter, we included a 10-item social desirability scale, which revealed higher scores (ranging from 0-10; $M = 6.3$, $SD = 2.2$) indicating some measure of participants providing socially-desirable responses (Crowne & Marlowe, 1960).

Conclusions

Despite school nurses' knowledge and positive attitudes towards the HPV vaccine, in our study's sample, the actual practice of providing education to parents and students about the HPV vaccine can be strengthened. Furthermore, the model proposed in this study revealed that school nurses' perceptions of their role as opinion leaders are influenced by their attitudes towards HPV and the HPV *vaccine*, which, in turn, affects their professional practice. These findings suggest that in order to foster professional practice regarding the HPV vaccine, the focus should be on increasing school nurses' positive attitudes towards the HPV vaccine as well as strengthening perceptions of their role as an opinion leader. Schools with school nurses have been shown to have higher vaccination rates in general (American Academy of Pediatrics Council on School Health, 2008) and can address parents and students concerns and questions about vaccines (Lockwood-Rayermann & McIntyre, 2009). School nurses are, therefore, pivotal in the efforts to increase the uptake of the HPV vaccine among young people in this country and as such, they can contribute even more significantly than they have in the past to lowering the high rates of sexually transmitted infections among American youth.

CHAPTER V

CONCLUSIONS

The central purpose of this study was to provide insight into school nurses' knowledge, views, and professional practice regarding the human papillomavirus (HPV) vaccine for youth. To this end, three independent articles were written: (1) a theoretical perspective describing the use of the Diffusion of Innovations (DOI) theory to explore school nurses' role as opinion leaders regarding the HPV vaccine for youth (Chapter II), (2) a systematic literature review assessing healthcare providers' knowledge, attitudes, intentions, perceptions, and professional practice regarding the HPV vaccine for youth (Chapter III), and (3) a survey study examining school nurses' knowledge, attitudes, perceptions of role as an opinion leader, and professional practice providing education to parents and students regarding the HPV vaccine for youth in the United States (US).

To gauge the potentially positive role school nurses may have as opinion leaders in disseminating information and promoting vaccination acceptance among US adolescents, we proposed utilizing the DOI theory (Chapter II). Diffusion of novel information or innovations is a process “by which (1) an *innovation* (2) is *communicated* through certain *channels* (3) *over time* (4) among the members of a *social system*” (Rogers, 2003, p. 11). Opinion leaders are defined as members within a *social system communicating* with and influencing other social system members about the *innovation* over a certain *time* period.

We argued that school nurses can function as opinion leaders for the HPV vaccine because they hold a unique type of leadership position in that they are able to influence both programs and policies through their cross-disciplinary understanding of the educational and health systems (Baisch et al., 2011; American Academy of Pediatrics Council on School Health, 2008). Through representing the healthcare system to parents, school nurses are able to help educate parents about healthcare issues and decisions regarding their children's health (Baisch et al., 2011; American Academy of Pediatrics Council on School Health, 2008).

Because opinion leaders' attitudes affect the diffusion process (Rogers, 2003), there is a need to understand school nurses' knowledge, attitudes, and professional practice regarding the HPV vaccine. Sometimes, however, there are inconsistencies between knowledge and attitudes as they relate to practice (or implementation) of an innovation. This inconsistency is referred to as the *knowledge, attitude, practice (KAP)-gap* (Rogers, 2003). In other words, a person might have high knowledge and positive attitudes towards an innovation, but not use the innovation. Thereby, the DOI theory offers a useful framework for researchers and practitioners in health promotion to understand the vaccine dissemination process and engage school nurses in promoting the HPV vaccine for youth.

Systematically examining the current literature (Chapter III) revealed a lack of research on school nurses regarding the HPV vaccine for youth, although the 28 studies included in the systematic review provided valuable information about healthcare providers in general. Overall, healthcare providers were likely to recommend the HPV

vaccine if the patient was female, if the patient was an older adolescent, and if the healthcare provider perceived fewer barriers to vaccination. Due to the HPV vaccine becoming widely available, there is a need to understand the beliefs, views, and behaviors of all populations involved in the HPV vaccine uptake (Zimet et al., 2006), including school nurses.

The systematic review pointed to the importance of communication about the HPV vaccine for increasing acceptance and vaccination rates. School nurses have a critical role in communicating with, and educating parents and adolescents about receiving the HPV vaccine (Bartlett & Peterson, 2011; Ehrhardt, 2007).

Surveying school nurses as healthcare providers provided a missing, yet innovative, perspective on the uptake of the HPV vaccine among adolescents (Chapter IV). Supporting the DOI theory's notion of the *KAP-gap*, this study revealed school nurses had moderate levels of knowledge and positive attitudes regarding the HPV vaccine, but infrequent professional practice providing HPV vaccine education to parents and students. Moreover, testing of a proposed model with data from 413 school nurses from the National Association of School Nurses revealed perceptions of being an opinion leader regarding the HPV vaccine as being influenced by their HPV and HPV vaccine attitudes, and these, in turn, affected their professional practice.

Results from the model testing imply that to increase school nurses' professional practice, there should be a focus on strengthening their perceptions of being an opinion leader regarding the HPV vaccine in addition to improving their attitudes towards the HPV vaccine. School nurses have been shown to have an impact on vaccination rates in

general (American Academy of Pediatrics Council on School Health, 2008), and are able to address parents' and students' fears and questions about vaccines (Lockwood-Rayermann & McIntyre, 2009). Thus, school nurses are vital in the attempt to increase HPV vaccination rates among US youth.

Our studies have important implications for research and practice. Further research on this issue, for instance, might focus on analyses of school nurses' social networks, to examine the flow of information through communication channels which school nurses are exposed, and assess their role and position in these networks. Practitioners designing programs to engage school nurses in disseminating the HPV vaccine may benefit from questioning whether their programs might be emphasizing non-crucial elements for influencing vaccine dissemination practice (e.g., knowledge) and de-emphasizing elements that are, indeed, influential (e.g., perceptions of role as opinion leaders).

Despite its contributions, this dissertation is inherently limited by the choice of methods, rates of participation in the survey, and theoretical biases. Nonetheless, we believe the study represents an important first step in understanding the inclusion of school nurses in the effort to promote HPV vaccine uptake and, ultimately, to prevent unnecessary morbidity and mortality among youth in the US.

REFERENCES

- American Academy of Pediatrics Council on School Health. (2008). Role of the school nurses in providing school health services. *Journal of School Nursing, 24*, 269-274.
- American Cancer Society. (2011). Cervical cancer overview. Retrieved March 12, 2012, from <http://www.cancer.org/Cancer/CervicalCancer/OverviewGuide/cervical-cancer-overview-key-statistics>
- Askelson, N. M., Campo, S., Lowe, J. B., Dennis, L. K., Smith, S., & Andsager, J. (2010). Factors related to physicians' willingness to vaccinate girls against HPV: The importance of subjective norms and perceived behavioral control. *Women & Health, 50*, 144-158.
- Ault, K. A. (2008). Human papillomavirus vaccines: An update for gynecologists. *Clinical Obstetrics & Gynecology, 51*, 527-532.
- Baisch, M. J., Lundeen, S. P., & Murphy, M. K. (2011). Evidence-based research on the value of school nurses in an urban school system. *Journal of School Health, 81*, 74-80.
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. prentice hall. Englewood Cliffs, NJ: Prentice Hall.
- Bandura, A. (1997). *Self efficacy: The exercise of control*. New York: W. H. Freeman and Company.

- Barnack, J. L., Reddy, D. M., & Swain, C. (2010). Predictors of parents' willingness to vaccinate for human papillomavirus and physicians' intentions to recommend the vaccine. *Women's Health Issues, 20*, 28-34.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic and statistical considerations. *Journal of Personality and Social Psychology, 51*, 1173-1182.
- Bartlett, J. A., & Peterson, J. A. (2011). The uptake of human papillomavirus (HPV) vaccine among adolescent females in the United States: A review of the literature. *Journal of School Nursing, 27*, 434-446.
- Bennett, J., Lubben, F., Hogarth, S., & Campbell, B. (2005). Systematic reviews of research in science education: Rigor or rigidity? *International Journal of Science Education, 27*, 387-406.
- Bennett, M. P. (2008). Ethics and the HPV vaccine: Considerations for school nurses. *The Journal of School Nursing, 24*, 275-283.
- Bero, L. A., Grilli, R., Grimshaw, J. M., Harvey, E., Oxman, A. D., & Thomson, M. A. (1998). Closing the gap between research and practice: An overview of systematic reviews of interventions to promote the implementation of research findings. *British Medical Journal, 317*, 465-468.
- Boehner, C. W., Howe, S. R., Bernstein, D. I., & Rosenthal, S. L. (2003). Viral sexually transmitted disease vaccine acceptability among college students. *Sexually Transmitted Diseases, 30*, 774-778.

- Bowman, K. G. (2007). A research synthesis overview. *Nursing Science Quarterly*, 20, 171-176.
- Boyce, T., & Holmes, A. (2012). Addressing health inequalities in the delivery of the human papillomavirus vaccination programme: Examining the role of the school nurse. *PLoS ONE*, 7, e43416.
- Brener, N. D., Wheeler, L., Wolfe, L. C., Vernon-Smile, M., & Caldart-Olson, L. (2007). Health services: Results from the school health policies and programs study 2006. *Journal of School Health*, 77, 464-485.
- Brewer, N. T., & Fazekas, K. I. (2007). Predictors of HPV vaccine acceptability: A theory-informed, systematic review. *Preventive Medicine*, 45, 107-114.
- Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen, & J. S. Long (Eds.), *Testing structural equation models* (pp. 136-162). Newbury Park, CA: Sage.
- Burch, M., Inderbitzin, K., Robarge, D. & Zacharski, S. (2010). National association of school nurses: Immunizations position statement. Retrieved March 12, 2013, from <http://www.nasn.org/PolicyAdvocacy/PositionPapersandReports/NASNPositionStatementsFullView/tabid/462/smId/824/ArticleID/8/Default.aspx>
- Burt, R. S. (1999). The social capital of opinion leaders. *Annals of the American Academy of Political and Social Science*, 566, 37-54.
- Bynum, S. A., Malo, T. L., Lee, J. H., Guiliano, A. R., & Vadaparampil, S. T. (2011). HPV vaccine information-seeking behaviors among US physicians: Government, media, or colleagues? *Vaccine*, 29, 5090-5093.

- Canham, D. L., Baurer, L., Concepcion, M., Luong, J., Peters, J., & Wilde, C. (2007).
An audit of medication administration: A glimpse into school health offices.
Journal of School Health, 23, 21-27.
- Centers for Disease Control and Prevention. (1999). Ten great public health
achievements—United States, 1900-1999. *MMWR, 48*, 241-243.
- Centers for Disease Control and Prevention. (2007). Quadrivalent human papillomavirus
vaccine: Recommendations of the Advisory Committee on Immunization Practices
(ACIP). *MMWR, 56*, 1-23.
- Centers for Disease Control and Prevention. (2009). Sexually transmitted diseases
(STDs): Genital HPV infection-fact sheet. Retrieved March 17, 2011 from
<http://www.cdc.gov/std/HPV/STDFact-HPV.htm>
- Centers for Disease Control and Prevention. (2010a). FDA licensure of bivalent human
papillomavirus vaccine (HPV2, Cervarix) for use in females and updated HPV
vaccination recommendations from the Advisory Committee on Immunization
Practices (ACIP). *MMWR, 59*, 626-629.
- Centers for Disease Control and Prevention. (2010b). FDA licensure of quadrivalent
human papillomavirus vaccine (HPV4, Gardasil) for use in males and guidance
from the Advisory Committee on Immunization Practices (ACIP). *MMWR, 59*,
630-632.
- Centers for Disease Control and Prevention. (2011a). HPV associated cancers statistics.
Retrieved March 12, 2012, from
<http://www.cdc.gov/cancer/hpv/statistics/index.htm>

Centers for Disease Control and Prevention. (2011b). Human papillomavirus (HPV): HPV vaccines. Retrieved March 18, 2011 from <http://www.cdc.gov/hpv/vaccine.html>

Centers for Disease Control and Prevention. (2012a). National and state vaccination coverage among adolescents aged 13 through 17 years-United States, 2011. *MMWR*, 61, 671-677.

Centers for Disease Control and Prevention. (2012b). Possible side-effects from vaccines. Retrieved April 7, 2012 from <http://www.cdc.gov/vaccines/vac-gen/side-effects.htm#hpvcervarix>

Centers for Disease Control and Prevention. (2013a). Genital HPV infection - fact sheet. Retrieved April 12, 2013, from <http://www.cdc.gov/std/HPV/STDFact-HPV.htm>

Centers for Disease Control and Prevention. (2013b). HPV vaccine for preteens and teens. Retrieved March 7, 2013, from <http://www.cdc.gov/vaccines/who/teens/vaccines/hpv.html>

Centers for Disease Control and Prevention. (2013c). HPV vaccines. Retrieved April 5, 2013 from <http://www.cdc.gov/hpv/vaccine.html>

Centers for Disease Control and Prevention. (2013d). Immunization schedules. Retrieved March 22, 2013, from <http://www.cdc.gov/vaccines/schedules/>

Clarke, M. (2007). The Cochrane collaboration and systematic reviews. *British Journal of Surgery*, 94, 391-392.

- Committee on Infectious Diseases. (2007). Prevention of human papillomavirus infection: Provisional recommendations for immunization of girls and women with quadrivalent human papillomavirus vaccine. *Pediatrics, 120*, 666-668.
- Conroy, K., Rosenthal, S. L., Zimet, G. D., Jin, Y., Bernstein, D. I., Glynn, S., & Kahn, J. A. (2009). Human papillomavirus vaccine uptake, predictors of vaccination, and self-reported barriers to vaccination *Journal of Women's Health, 18*, 1679-1686.
- Cook, C., Heath, F., & Thompson, L. R. (2000). A meta-analysis of response rates in web- or internet-based surveys. *Educational and Psychological Measurement, 60*, 821-836.
- Crowne, D. P., & Marlowe, D. (1960). A new scale of social desirability independent of psychopathology. *Journal of Consulting Psychology, 24*, 349-354.
- Cumming, G., & Finch, S. (2001). A primer on the understanding, use and calculation of confidence intervals that are based on central and noncentral distributions. *Educational and Psychological Measurement, 61*, 532-575.
- Daley, M. F., Crane, L. A., Markowitz, L. E., Black, S. R., Beaty, B. L., Barrow, J., . . . Kempe, A. (2010). Human papillomavirus vaccination practices: A survey of US physicians 18 months after licensure. *Pediatrics, 126*, 425-433.
- Daley, M. F., Liddon, N., Crane, L. A., Beaty, B. L., Barrow, J., Babbel, C., . . . Kempe, A. (2006). A national survey of pediatrician knowledge and attitudes regarding human papillomavirus vaccination. *Pediatrics, 118*, 2280-2289.

- Davis, K., Dickman, E. D., Ferris, D., & Dias, J. K. (2004). Human papillomavirus vaccine acceptability among parents of 10- to 15-year-old adolescents. *Journal of Lower Genital Tract Disease, 8*, 188-194.
- Dearing, J. W. (2009). Applying Diffusion of Innovation theory to intervention development. *Research on Social Work Practice, 19*, 503-518.
- Dempsey, A. F., Zimet, G. D., Davis, R. L., & Koutsky, L. (2006). Factors that are associated with parental acceptance of human papillomavirus vaccines: A randomized intervention study of written information about HPV. *Pediatrics, 117*, 1486-1493.
- Dempsey, A. F., & Zimet, G. D. (2008). Human papillomavirus vaccine and adolescents. *Current Opinion in Obstetrics & Gynecology, 20*, 447-454.
- DeSocio, J., & Hootman, J. (2004). Children's mental health and school success. *Journal of School Nursing, 20*, 189-196.
- DeVellis, R. F. (2003). *Scale development: Theory and applications* (2nd ed.). Thousand Oaks, CA: Sage Publications.
- Dillman, D. A. (2007). *Mail and internet surveys: The tailored design method* (2nd ed.). Hoboken, NJ: Wiley & Sons, Inc.
- Dunne, E. F., Unger, E. R., Sternberg, M., McQuillan, G., Swan, D. C., Patel, S. S., & Markowitz, L. E. (2007). Prevalence of HPV infection among females in the United States. *Journal of American Medical Association, 297*(8), 813-819.
- Ehrhardt, J. (2007). What school nurses need to know about cervical cancer, HPV and the new vaccine. *The Journal of School Nursing, 23*, 310-314.

- Ethan, D., & Basch, C. E. (2008). Promoting healthy vision in students: Progress and challenges in policy, programs, and research. *Journal of School Health, 78*, 411-416.
- Farris, K. B., McCarthy, A. M., Kelly, M. W., Clay, D., & Gross, J. W. (2003). Issues of medication administration and control in Iowa schools. *Journal of School Health, 73*, 331-337.
- Feemster, K. A., Winters, S. E., Fiks, A. G., Kinsman, S., & Kahn, J. A. (2008). Pediatricians' intention to recommend human papillomavirus (HPV) vaccines to 11- to 12-year-old girls postlicensing. *Journal of Adolescent Health, 43*, 408-411.
- Ferrence, R. (2001). Diffusion theory and drug use. *Addiction, 96*, 165-173.
- Ficca, M., & Welk, D. (2006). Medication administration practices in Pennsylvania schools. *Journal of School Nursing, 3*, 148-155.
- Fisher, R., Darrow, D. H., Tranter, M., & Williams, J. V. (2008). Human papillomavirus vaccine: Recommendations, issues and controversies. *Current Opinion in Pediatrics, 20*, 441-445.
- Gamble, H. L., Klosky, J. L., Parra, G. R., & Randolph, M. E. (2010). Factors influencing familial decision-making regarding human papillomavirus vaccination. *Journal of Pediatric Psychology, 35*, 704-715.
- Garcini, L. M., Galvan, T., & Barnack-Tavlaris, J. L. (2012). The study of human papillomavirus (HPV) vaccine uptake from a parental perspective: A systematic review of observational studies in the United States. *Vaccine, 30*, 4588-4595.

- Garrard, J. (2010). *Health sciences literature review made easy: The matrix method*. (3rd ed.). Sudbury, MA: Jones and Bartlett Publishers.
- Gerend, M. A., Lee, S. C., & Shepherd, J. E. (2006). Predictors of human papillomavirus vaccination acceptability among underserved women. *Sexually Transmitted Diseases, 33*, 1-4.
- Giuliano, A. R., Lee, J., Fulp, W., Villa, L. L., Lazcano, E., Papenfuss, M. R., . . . Smith, D. (2011). Incidence and clearance of genital human papillomavirus infection in men (HIM): A cohort study. *Lancet, 377*, 932-940.
- Gladwell, M. (2002). *The tipping point: How little things can make a big difference*. New York: Back Bay Books/Little, Brown and Company.
- Goodson, P. (2010). *Theory in health promotion research and practice: Thinking outside the box*. Sudbury, MA: Jones and Bartlett Publishers.
- Göriz, A. S. (2010). Using lotteries, loyalty points, and other incentives to increase participant response and completion. In S. D. Gosling, & J. A. Johnson (Eds.), *Advanced methods for conducting online behavioral research* (pp. 219-233). Washington, DC: American Psychological Association.
- Gottvall, M., Tyden, T., Larsson, M., Stenhammar, C., & Høglund, A. T. (2011). Challenges and opportunities of a new HPV immunization program perceptions among Swedish school nurses. *Vaccine, 29*, 4576-4583.
- Green, L. W., Gottlieb, N. H., & Parcel, G. S. (1991). Diffusion theory extended and applied. In W. B. Ward, & F. M. Lewis (Eds.), *Advances in health education and promotion*. London: Jessica Kingsley.

- Green, L. W., Ottoson, J. M., Garcia, C., & Hiatt, R. A. (2009). Diffusion theory and knowledge dissemination utilization and integration in public health. *Annual Review of Public Health, 30*, 151-174.
- Gutt, U. M., Engelke, M. K., & Swanson, M. (2004). Does the school nurse to student ratio make a difference? *Journal of School Health, 74*, 6-9.
- Henson, R. K. (2001). Understanding internal consistency reliability estimates: A conceptual primer on coefficient alpha. *Measurement and Evaluation in Counseling and Development, 34*, 177-189.
- Herzog, T. J., Huh, W. K., Downs, L. S., Smith, J. S., & Monk, B. J. (2008). Initial lessons learned in HPV vaccination. *Gynecologic Oncology, 109*, S4-11.
- Hilton, S., Hunt, K., Bedford, H., & Petticrew, M. (2011). School nurses' experiences of delivering the UK HPV vaccination programme in its first year. *BMC Infectious Diseases, 11*, 226.
- Holmbeck, G. N. (1997). Toward terminological, conceptual, and statistical clarity in the study of mediators and moderators: Examples for the child-clinical and pediatric psychology literatures. *Journal of Consulting and Clinical Psychology, 65*, 599-610.
- Hu, L., & Bentler, P. M. (1998). Fit indices in covariance structure modeling: Sensitivity to underparameterized model misspecification. *Psychological Methods, 3*, 424-453.
- Huey, N. L., Clark, A. D., Kluhsman, B. C., Lengerich, E. J., & ACTION Health Cancer Task, F. (2009). HPV vaccine attitudes and practices among primary care providers in Appalachian Pennsylvania. *Preventing Chronic Disease, 6*, A49.

Ishibashi, K. L., Koopmans, J., Curlin, F. A., Alexander, K. A., & Ross, L. F. (2008a).

Paediatricians' attitudes and practices towards HPV vaccination. *Acta Paediatrica*, *97*, 1550-1556.

Ishibashi, K. L., Koopmans, J., Curlin, F. A., Alexander, K. A., & Ross, L. F. (2008b).

Pediatricians are more supportive of the human papillomavirus vaccine than the general public. *Southern Medical Journal*, *101*, 1216-1221.

Jaspan, D. M., Dunton, C. J., & Cook, T. L. (2008). Acceptance of human

papillomavirus vaccine by gynecologists in an urban setting. *Journal of Lower Genital Tract Disease*, *12*, 118-121.

Jensen, M. E., Hartenbach, E., McElroy, J. A., Faerber, A., Havighurst, T., Kim, K. M.,

& Bailey, H. H. (2009). Brief report: Measuring the attitudes of health care professionals in Dane county toward adolescent immunization with HPV vaccine. *Wisconsin Medical Journal*, *108*, 203-205.

Jenson, H. B. (2009). Human papillomavirus vaccine: A paradigm shift for pediatricians.

Current Opinion in Pediatrics, *21*, 112-121.

Johnson, P. E., & Hayes, J. M. (2006). Medication use in school. *American Journal of*

Health-System Pharmacy, *63*, 1277-1285.

Kahn, J. A., Rosenthal, S. L., Hamann, T., & Bernstein, D. I. (2003). Attitudes about

human papillomavirus vaccine in young women. *International Journal of STD & AIDS*, *14*, 300-306.

Kahn, J. A., Cooper, H. P., Vadaparampil, S. T., Pence, B. C., Weinberg, A. D., LoCoco,

S. J., & Rosenthal, S. L. (2009). Human papillomavirus vaccine recommendations

- and agreement with mandated human papillomavirus vaccination for 11-to-12-year-old girls: A statewide survey of Texas physicians. *Cancer Epidemiology, Biomarkers & Prevention*, *18*, 2325-2332.
- Kahn, J. A., Zimet, G. D., Bernstein, D. I., Riedesel, J. M., Lan, D., Huang, B., & Rosenthal, S. L. (2005). Pediatricians' intention to administer human papillomavirus vaccine: The role of practice characteristics, knowledge, and attitudes. *Journal of Adolescent Health*, *37*, 502-510.
- Katz, E., & Lazarsfeld, P. F. (1955). *Personal influence*. Glencoe, IL: Free Press.
- Katz, I. T., Ware, N. C., Gray, G., Haberer, J. E., Mellins, C. A., & Bangsberg, D. R. (2010). Scaling up human papillomavirus vaccination: A conceptual framework of vaccine adherence. *Sexual Health*, *7*, 279-286.
- Kenny, D. A. (2013). Mediation. Retrieved April 22, 2013, from <http://davidakenny.net/cm/mediate.htm>
- Kessels, S. J. M., Marshall, H. S., Watson, M., Braunack-Mayer, A. J., Reuzel, R., & Tooher, R. L. (2012). Factors associated with HPV vaccine uptake in teenage girls: A systematic review. *Vaccine*, *30*, 3546-3556.
- Kimmel, S. R. (2006). Practical implementation of HPV vaccines in clinical practice. *Journal of Family Practice*, *55*, 18-22.
- Kittleson, M. J. (1997). Determining effective follow-up of e-mail surveys. *American Journal of Health Behavior*, *21*(3), 193-196.
- Kittleson, M. J., & Brown, S. L. (2005). E-mail versus web survey response rates among health education professionals. *American Journal of Health Studies*, *20*, 7-14.

- Ko, E. M., Missmer, S., & Johnson, N. R. (2010). Physician attitudes and practice toward human papillomavirus vaccination. *Journal of Lower Genital Tract Disease, 14*, 339-345.
- Kollar, L. M., & Kahn, J. A. (2008). Education about human papillomavirus and human papillomavirus vaccines in adolescents. *Current Opinion in Obstetrics & Gynecology, 20*, 479-483.
- Krieger, J. L., Katz, M. L., Kam, J. A., & Roberto, A. (2012). Appalachian and non-Appalachian pediatricians' encouragement of the human papillomavirus vaccine: Implications for health disparities. *Women's Health Issues, 22*, e19-26.
- Leddy, M. A., Anderson, B. L., Gall, S., & Schulkin, J. (2009). Obstetrician-gynecologists and the HPV vaccine: Practice patterns, beliefs, and knowledge. *Journal of Pediatric and Adolescent Gynecology, 22*, 239-246.
- Lockwood-Rayermann, S., & McIntyre, S. J. (2009). Understanding HPV disease and prevention: A guide for school nurses. *Journal of School Nursing, 25*, 261-269.
- Lomas, J., Enkin, M., Anderson, G. M., Hannah, W. J., Vayda, E., & Singer, J. (1991). Opinion leaders vs audit and feedback to implement practice guidelines. *Journal of American Medical Association, 265*, 2202-2207.
- Mathur, M. B., Mathur, V. S., & Reichling, D. B. (2010). Participation in the decision to become vaccinated against human papillomavirus by California high school girls and the predictors of vaccine status. *Journal of Pediatric Healthcare, 24*, 14-24.
- McCave, E. L. (2010). Influential factors in HPV vaccination uptake among providers in four states. *Journal of Community Health, 35*, 645-652.

- Montano, D. E., & Kasprzyk, D. (2008). Theory of Reasoned Action, Theory of Planned Behavior, and the Integrated Behavioral Model. In K. Glanz, B. K. Rimer & K. Viswanath (Eds.), *Health behavior and health education: Theory, research, and practice* (4th ed., pp. 67-96). San Francisco, CA: Jossey-Bass.
- Moonie, S., Sterling, D. A., Figgs, L. W., & Castro, M. (2008). The relationship between school absence, academic performance, and asthma status. *Journal of School Health, 73*, 140-148.
- Nagaraj, A. (2006). Does qualitative synthesis of anecdotal evidence with that from scientific research help in understanding public health issues: A review of low MMR uptake. *European Journal of Public Health, 16*, 85-88.
- National Cancer Institute. (2011). Fact sheet: Human papillomavirus (HPV) vaccine. Retrieved April 18, 2013, from <http://www.cancer.gov/cancertopics/factsheet/prevention/HPV-vaccine>
- National Cancer Institute. (2012). A to Z list of cancers. Retrieved March 12, 2012, from <http://www.cancer.gov/cancertopics/types/alphabet>
- Olshen, E., Woods, E. R., Austin, S. B., Luskin, M., & Bauchner, H. (2005). Parental acceptance of the human papillomavirus vaccine. *Journal of Adolescent Health, 37*, 248-251.
- Pearce, C. F., Wolfe, L. M., DePasquale, S. E., & Breen, J. M. (2009). Physician knowledge and opinions about sexually transmitted infections and the human papillomavirus vaccine: A community based survey. *Tennessee Medicine, 102*, 33-35.

- Porter, S. R., & Whitcomb, M. E. (2005). E-mail subject lines and their effect on web survey viewing and response. *Social Science Computer Review*, 23, 380-387.
- Raley, J. C., Followwill, K. A., Zimet, G. D., & Ault, K. A. (2004). Gynecologists' attitudes regarding human papilloma virus vaccination: A survey of fellows of the American college of obstetricians and gynecologists. *Infectious Diseases in Obstetrics & Gynecology*, 12, 127-133.
- Reiter, P. L., Stubbs, B., Panozzo, C. A., Whitesell, D., & Brewer, N. T. (2011). HPV and HPV vaccine education intervention: Effects on parents, healthcare staff, and school staff. *Cancer Epidemiology, Biomarkers & Prevention*, 20, 2354-2361.
- Rice, R. E. (1993). Using network concepts to clarify sources and mechanisms of social influence. In W. D. Richards, & G. A. Barnett (Eds.), *Progress in communication sciences*. Norwood, NJ: Ablex.
- Riedesel, J. M., Rosenthal, S. L., Zimet, G. D., Bernstein, D. I., Huang, B., Lan, D., & Kahn, J. A. (2005). Attitudes about human papillomavirus vaccine among family physicians. *Journal of Pediatric & Adolescent Gynecology*, 18, 391-398.
- Roberto, A., J., Krieger, J., L., Katz, M., L., Goei, R., & Jain, P. (2011). Predicting pediatricians' communication with parents about the human papillomavirus (HPV) vaccine: An application of the theory of reasoned action. *Health Communication*, 26, 303-312.
- Rogers, E. M. (1973). *Communication strategies for family planning*. New York: Free Press.

- Rogers, E. M. (2002). Diffusion of prevention innovations. *Addictive Behaviors, 27*, 989-993.
- Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). New York, NY: Free Press.
- Roux, A. V. D. (2011). Complex systems thinking and current impasses in health disparities research. *American Journal of Public Health, 101*, 1627-1634.
- Saladek, R. M., Phillips, P. A., & Bond, M. J. (2006). Implementation science: A role for parallel dual processing models of reasoning? *Implementation Science, 1*, 1-8.
- Salant, P., & Dillman, D. A. (1994). *How to conduct your own survey*. New York: John Wiley & Sons, Inc.
- Salmon, D. A., Moulton, L. H., Omer, S. B., Chace, L. M., Klassen, A., Talebian, P., & Halsey, N. A. (2004). Knowledge, attitudes, and beliefs of school nurses and personnel and associations with nonmedical immunization exemptions *Pediatrics, 113*, e552-9.
- Saraiya, M., Rosser, J. I., & Cooper, C. P. (2012). Cancers that US physicians believe the HPV vaccine prevents: Findings from a physician survey, 2009. *Journal of Women's Health, 21*, 111-117.
- Schnatz, P. F., Humphrey, K., & O'Sullivan, D. M. (2010). Assessment of the perceptions and administration of the human papillomavirus vaccine. *Journal of Lower Genital Tract Disease, 14*, 103-107.
- Schulz, K. F., Chalmers, I., Hayes, R. J., & Altman, D. G. (1995). Empirical evidence of bias: Dimensions of methodological quality associated with estimates of treatment

- effects in controlled trails. *Journal of the American Medical Association*, 273, 408-12.
- Serpell, L., & Green, J. (2006). Parental decision-making in childhood vaccination. *Vaccine*, 24, 4041-4046.
- Soumerai, S. B., McLaughlin, T. J., Gurwitz, J. H., Guadagnoli, E., Hauptman, P. J., Borbas, C., . . . Gobel, F. (1998). Effect of local medical opinion leaders on quality of care for acute myocardial infarction: A randomized controlled trial. [null] *Journal of the American Medical Association*, 279, 1358-1363.
- SPSS Inc. (2007). *PASW statistics 18*. Chicago, IL: SPSS Inc.
- SPSS Inc. (2010). *Amos 5*. Chicago, IL: SPSS Inc.
- Tariq, S., Bhakta, S., Grimes, A., & Stevens, A. (2009). Attitudes of Arkansas' primary care physicians toward the HPV vaccine. *Journal of the Arkansas Medical Society*, 106, 113-117.
- Thompson, B. (2006). *Foundations of behavioral statistics*. New York, NY: The Guilford Press.
- Thompson, G. N., Estabrooks, C. A., & Degner, L. F. (2006). Clarifying the concepts in knowledge transfer: A literature review. *Journal of Advanced Nursing*, 53, 691-701.
- US Department of Health and Human Services. (2012). Healthy People 2020: Immunization and infectious disease. Retrieved April 10, 2012 from <http://www.healthypeople.gov/2020/>

- US Department of Labor Bureau of Labor Statistics. (2009). Standard occupational classification: 21-1091 health educators. Retrieved April 14, 2013, from http://www.bls.gov/soc/2000/soc_f1j1.htm
- US Food and Drug Administration. (2010). Gardasil (human papillomavirus vaccine) questions and answers - Gardasil, June 8, 2006. Retrieved April 23, 2012 from <http://www.fda.gov/BiologicsBloodVaccines/Vaccines/QuestionsaboutVaccines/ucm096052.htm>
- Vadaparampil, S. T., Kahn, J. A., Salmon, D., Lee, J. H., Quinn, G. P., Roetzheim, R., . . . Giuliano, A. R. (2011). Missed clinical opportunities: Provider recommendations for HPV vaccination for 11-12 year old girls are limited. *Vaccine, 29*, 8634-8641.
- Valente, T. W. (1993). Diffusion of innovations and policy decision-making. *Journal of Communication, 43*, 30-45.
- Valente, T. W. (1995). *Network models of the diffusion of innovations*. Creeskill, NJ: Hampton Press.
- Valente, T. W., Hoffman, B. R., Ritt-Olson, A., Lichtman, K., & Johnson, C. A. (2003). Effects of a social-network method for group assignment strategies on peer-led tobacco prevention programs in schools. *American Journal of Public Health, 93*, 1837-1842.
- Valente, T. W., & Rogers, E. M. (1995). The origins and development of the diffusion of innovations paradigm as an example of scientific growth. *Science Communication: An Interdisciplinary Social Science Journal, 16*, 238-69.

- Valente, T. W., & Davis, R. L. (1999). Accelerating the diffusion of innovations using opinion leaders. *The ANNALS of the American Academy of Political and Social Science, 566*, 55-67.
- Valente, T. W., & Pumpuang, P. (2007). Identifying opinion leaders to promote behavior change. *Health Education Behavior, 34*, 881-896.
- Waldrop, M. M. (1992). *Complexity*. Los Angeles: Touchstone Books.
- Weinstock, H., Berman, S., & Cates, W. J. (2004). Sexually transmitted diseases among American youth: Incidence and prevalence estimates, 2000. *Perspectives on Sexual and Reproductive Health, 36*, 6-10.
- Weiss, T. W., Zimet, G. D., Rosenthal, S. L., Brenneman, S. K., & Klein, J. D. (2010). Human papillomavirus vaccination of males: Attitudes and perceptions of physicians who vaccinate females. *Journal of Adolescent Health, 47*, 3-11.
- World Health Organization. (2009). Women's health. Retrieved April 12, 2013, from <http://www.who.int/mediacentre/factsheets/fs334/en/>
- Young, J. L., Bernheim, R. G., Korte, J. E., Stoler, M. H., Guterbock, T. M., & Rice, L. W. (2011). Human papillomavirus vaccination recommendation may be linked to reimbursement: A survey of Virginia family practitioners and gynecologists. *Journal of Pediatric & Adolescent Gynecology, 24*, 380-385.
- Zimet, G. D. (2005). Improving adolescent health: Focus on HPV vaccine acceptance. *Journal of Adolescent Health, 37*, S17-23.
- Zimet, G. D. (2006). Understanding and overcoming barriers to human papillomavirus vaccine acceptance. *Current Opinion in Obstetrics & Gynecology, 18*, s23-28.

Zimet, G. D., Liddon, N., Rosenthal, S. L., Lazcano-Ponce, E., & Allen, B. (2006).

Chapter 24: Psychosocial aspects of vaccine acceptability. *Vaccine*, 24, 201-209.

APPENDIX A
SURVEY INSTRUMENT

Demographics: *The following items are to assess your current demographic information.*

What is your gender (select **one** response)?

- a. male
- b. female

What is your current age in years (i.e., 65 years old)?
_____years old

What race/ethnicity do you **MOST** identify with (select **one** response)?

- a. American Indian or Alaska Native
- b. Asian
- c. Black or African American
- d. Hispanic or Latino
- e. Native Hawaiian or other Pacific Islander
- f. White

Please select one of the following that best describes your role within the school (select **one** response):

- a. registered nurse (RN)
- b. vocational nurse (LVN)
- c. practical nurses (LPN)
- d. registered nurse practitioner
- e. nurse's assistant
- f. retired
- g. Other

How many years (rounded to the nearest year) have you been or were a registered nurse (RN), vocational nurse (LVN), practical nurses (LPN), registered nurse practitioner, nurse's assistant, or other?

_____years

How many years (rounded to the nearest year) have you worked in the **school environment** as a registered nurse (RN), vocational nurse (LVN), practical nurses (LPN), registered nurse practitioner or nurse's assistant?

_____years

In which state do you currently work (including overseas military bases or US territories)?

Which of the following describes the *geographic area* in which you currently work (select **one** response)?

- a. metropolitan (population 500,000 or more people)
- b. urban (population 100,000 or more and less than 500,000 people)
- c. rural (population less than 100,000 people)

In what type of school setting do you work (select **one** response)?

- a. public
- b. private (school supported by private organization or private individuals)
- c. parochial (school supported by a church or parish)
- d. charter
- e. other_____

What grade level(s) are you currently serving this school year (select **all** that apply)?

- a. 12th grade
- b. 11th grade
- c. 10th grade
- d. 9th grade
- e. 8th grade
- f. 7th grade
- g. 6th grade
- h. 5th grade
- i. 4th grade
- j. 3rd grade
- k. 2nd grade
- l. 1st grade
- m. Kindergarten
- n. Pre- Kindergarten

Who is your employer (i.e., an independent school district, hospital, home health agency, etc.)?

Attitudes (Beliefs): *For the following items, please select the response that best represents your beliefs.*

I believe HPV causes major medical problems.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

I believe HPV is harmful to a person's health.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

I believe HPV weakens a person's immune system.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

I believe HPV NEGATIVELY impacts a person's wellness.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

I believe HPV is NOT a deadly virus.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

I believe for the majority of the population the HPV vaccine is safe.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

I believe for the majority of the population there is little risk in receiving the HPV vaccine.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

I believe for the majority of the population the HPV vaccine is nontoxic (i.e., nonpoisonous, not dangerous).

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

I believe for the majority of the population the HPV vaccine causes adverse health effects.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

I believe the HPV vaccine is effective at preventing HPV.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

I believe the HPV vaccine prevents cancers related to HPV.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

I believe the HPV vaccine prevents genital warts related to HPV.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

I believe the HPV vaccine has NOT been on the market long enough to be considered safe.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

I believe students' immune systems are weakened by the HPV vaccine.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

I believe that although the HPV vaccine was FDA approved, the HPV vaccine is NOT safe.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

I believe the HPV vaccine is NOT effective at preventing HPV.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

I believe the HPV vaccine hinders HPV from infecting the person who received the vaccine.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

I believe the HPV vaccine improves students' immune systems to defend against HPV.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

I believe ONLY female students should be vaccinated against HPV.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

I believe ONLY male students should be vaccinated against HPV.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

I believe male *and* female students should be vaccinated against HPV.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

I believe preteens should receive the HPV vaccine.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

I believe preteens should receive the HPV vaccine before they become sexually active.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

I believe by providing my professional opinion, I influence parents to vaccinate their child/adolescent against HPV.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

I believe if I provide information to parents, they will vaccinate their child/adolescent against HPV.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

I currently see myself as a leader in providing HPV vaccine information in the school community.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

Attitudes (Values): *For the following items, please rank your agreement.*

It is important to me as a medical professional...

for students to avoid major medical problems.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

to avoid harm when dealing with a person's health.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

for students to avoid a deadly virus.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

that a vaccine be safe.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

that a vaccine be nontoxic (i.e., nonpoisonous, not dangerous).

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

for students to avoid adverse health effects from vaccines.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

that a vaccine be on the market a certain amount of time to be considered safe.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

for students to have strong immune systems.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

for the HPV vaccine to be effective at preventing HPV.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

for the HPV vaccine to be effective at preventing HPV related cancers.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

for the HPV vaccine to be effective at preventing HPV related genital warts.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

for female students to be vaccinated against HPV.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

for male AND female students to be vaccinated against HPV.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

for MALE students to be vaccinated against HPV.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

for preteens to be vaccinated against HPV.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

for preteens, before they become sexually active, to be vaccinated against HPV.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

to provide HPV vaccine information to parents.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

to provide my professional opinion about the HPV vaccine to parents.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

for parents to vaccinate their child/adolescent against HPV.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

for me to influence parents to vaccinate their child/adolescent against HPV.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

to be leader in providing HPV vaccine information in the school community.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

Professional Practice: *For the following items, please indicate your professional practice according to each statement.*

During the last academic year I provided. . .

parents with information about HPV vaccination providers (names, addresses, phone number).

- a. never
- b. sometimes
- c. often
- d. always

resources (i.e., pamphlets, websites, and flyers) to parents about HPV vaccine.

- a. never
- b. sometimes
- c. often
- d. always

STUDENTS with information about HPV vaccination providers (names, addresses, phone number).

- a. never
- b. sometimes
- c. often
- d. always

resources (i.e., pamphlets, websites, and flyers) to STUDENTS about the HPV vaccine when the students were IN my office.

- a. never
- b. sometimes
- c. often
- d. always

resources (i.e., pamphlets, websites, and flyers) to STUDENTS about the HPV vaccine OUTSIDE of my office within the school environment.

- a. never
- b. sometimes
- c. often
- d. always

resources (i.e., pamphlets, websites, and flyers) to STUDENTS about the HPV vaccine whether or not students asked for the resources.

- a. never
- b. sometimes
- c. often
- d. always

During the last academic year, I had informational sheets about HPV vaccine in my office.

- a. never
- b. sometimes
- c. often
- d. always

During the last academic year approximately how many hours did you. . .

talk directly to parents about the HPV vaccine.

spend giving educational session(s) (i.e., one day seminars) about the HPV vaccine to parents.

talk directly to individual STUDENTS about HPV vaccine.

spend giving educational session(s) during regular class-time specifically about the HPV vaccine to STUDENTS.

Have you spent teaching lesson(s) to STUDENTS that included information about the HPV vaccine.

spend professional time (i.e., time spent on the clock) looking up information about the HPV vaccine.

attend continuing education regarding the HPV vaccine.

spend looking for methods to provide education to parents about the HPV vaccine.

spend looking for methods to provide education to STUDENTS about HPV vaccine.

Currently, I can provide health education to parents without violating school district policy.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

Currently, my school district supports the health education I provide to parents.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

Currently, I can provide health education to STUDENTS without violating school district policy.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

Currently, my school district supports the health education I provide to STUDENTS.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

Currently, any health information I disseminate to STUDENTS or PARENTS must have approval from the school district.

- a. strongly disagree
- b. disagree
- c. agree
- d. strongly agree

Social Desirability: *For the following, please provide your answer.*

I'm always willing to admit it when I make a mistake.

a. True

b. False

I always try to practice what I preach.

a. True

b. False

I like to gossip at times.

a. True

b. False

There have been occasions when I took advantage of someone.

a. True

b. False

I sometimes try to get even rather than forgive and forget.

a. True

b. False

I never resent being asked to return a favor.

a. True

b. False

I have never been irked when people expressed ideas very different from my own.

a. True

b. False

I have never deliberately said something that hurt someone's feelings.

a. True

b. False

At times I have really insisted on having things my own way.

a. True

b. False

There have been occasions when I felt like smashing things.

a. True

b. False

Knowledge Items: *For the following items, please select the correct answer.*

The most common sexually transmitted disease is:

- a. HIV
- b. HPV**
- c. Herpes
- d. Chlamydia

At least _____% of sexually active people have been infected with HPV at some point in their lives.

- a. 10
- b. 25
- c. 50**
- d. 80

The MAJORITY of people infected with HPV develop which of the following health symptoms:

- a. genital warts
- b. cervical cancer
- c. cancer of the throat
- d. no symptoms**

LOW risk HPV is known to cause which of the following:

- a. genital warts**
- b. cancer
- c. pain during intercourse
- d. urinary tract infection

HIGH risk HPV is known to cause which of the following:

- a. genital warts
- b. cancer**
- c. pain during intercourse
- d. urinary tract infection

Women can receive direct testing for HPV through the use of:

- a. Pap smear
- b. pelvic exam
- c. HPV test**
- d. a test for HPV does not exist

Which test can detect changes in the cervix that may lead to HPV-related cancer?

- a. a Pap smear**
- b. pelvic exam
- c. HPV test
- d. such test does not exist

HPV can be spread person-to-person through which of the following contacts?

- a. mutual masturbation
- b. outer-course
- c. opened mouth kissing
- d. oral-to-genital**

HPV is known to infect the genitals, but the _____ has also been reported as a site of infection.

- a. eyes
- b. ears
- c. throat**
- d. nose

The HPV vaccine is available for which age group:

- a. 5 to 22 years
- b. 9 to 26 years**
- c. 16 to 32 years
- d. 21 to 38 years

The Gardasil® HPV vaccine is available for:

- a. males only
- b. females only
- c. males and females**
- d. teens only

The Cevarix® HPV vaccine is available for:

- a. males only
- b. females only**
- c. males and females
- d. teens only

The HPV vaccine requires ____ dose(s).

- a. one
- b. two
- c. three**
- d. four

The HPV vaccine dose(s) are recommended to be administered:

- a. once
- b. over a four week period
- c. over a three month period
- d. over a six month period**

How many different types of HPV vaccines are available on the market?

- a. one
- b. two**
- c. three
- d. four

The HPV vaccine is most effective when dose(s) are received before:

- a. sexual contact with any partner**
- b. the start of the 6th grade
- c. his/her 9th birthday
- d. his/her 16th birthday

The HPV vaccine is used to:

- a. prevent infection from specific types HPV strains**
- b. prevent infection from most HPV strains
- c. treat existing HPV infections
- d. none of the above

The HPV vaccine protects against HPV strains which help prevent:

- a. pelvic inflammatory disease
- b. cervical cancer**
- c. uterine cancer
- d. testicular cancer

Which of the following serious side effects from the HPV vaccine has been documented and verified by medical personnel?

- a. hair loss
- b. autism
- c. acne
- d. no serious side effects have been documented**

Mild side effects that could occur after receiving the HPV vaccine may include:

- a. fever**
- b. moodiness
- c. drowsiness
- d. none

The HPV vaccine Gardasil® is different from the HPV vaccine Cervarix® in that:

- a. there is no difference
- b. Gardasil® protects *ONLY* against HPV types 6 and 11 (genital warts)
- c. Gardasil® protects *ONLY* against HPV types 16 and 18 (cancers)
- d. Gardasil® protects against HPV types 6 and 11 (genital warts) and 16 and 18 (cancers)**

APPENDIX B

TABLE OF KNOWLEDGE INDEX SCORES

Items	<i>M</i>	<i>SD</i>
1. The most common sexually transmitted disease is <i>HPV</i> .	0.52	0.50
2. At least <i>50%</i> of sexually active people have been infected with HPV at some point in their lives.	0.38	0.49
3. The MAJORITY of people infected with HPV develop <i>no symptoms</i> .	0.48	0.50
4. LOW risk HPV is known to cause <i>genital warts</i> .	0.83	0.38
5. HIGH risk HPV is known to cause <i>cancer</i> .	0.92	0.27
6. HPV is known to infect the genitals, but the <i>throat</i> has also been reported as a site of infection.	0.95	0.23
7. The HPV vaccine is available for <i>9 to 26 years old</i> .	0.94	0.23
8. The Gardasil® HPV vaccine is available for <i>males and females</i> .	0.89	0.31
9. The Cevarix® HPV vaccine is available for <i>females only</i> .	0.49	0.50
10. The HPV vaccine requires <i>three</i> doses.	0.80	0.40
11. The HPV vaccine doses are recommended to be administered <i>over a six month period</i> .	0.74	0.44
12. <i>Two</i> different types of HPV vaccines are available on the market.	0.81	0.39
13. The HPV vaccine is used to <i>prevent infection from specific HPV strains</i> .	0.67	0.47
14. The HPV vaccine Gardasil® is different from the HPV vaccine Cervarix® in that <i>Gardasil® protects against HPV types 6 and 11 (genital warts) and 16 and 18 (cancers)</i> .	0.57	0.50

Note. Italicized text is the correct response for the item.

APPENDIX C

TABLE OF ATTITUDE SCALE SCORES

Items	Factor	<i>M</i>	<i>SD</i>
1. Important for students to avoid deadly virus	I	10.8	3.6
2. HPV vaccine is safe	I	12.2	3.0
3. HPV vaccine is nontoxic	I	12.0	3.1
4. HPV vaccine has adverse health effects	I	11.3	3.2
5. HPV has not been on the market long enough to be safe	I	8.7	2.8
6. HPV vaccine prevents HPV	I	11.5	3.1
7. HPV vaccine prevents cancer	I	11.7	3.2
8. HPV vaccine prevents genital warts	I	10.4	3.3
9. Males and females should receive HPV vaccine	I	11.5	3.7
10. Preteens should receive HPV vaccine	I	10.7	4.1
11. Preteens should receive HPV vaccine before they become sexually active	I	11.2	4.0
12. HPV causes major medical problems	II	9.7	4.1
13. HPV is harmful to health	II	9.5	4.4
14. HPV weakens the immune system	II	7.4	3.2

Note: Factor I = Attitudes about HPV vaccine; Factor II = Attitudes about HPV

APPENDIX D

TABLE OF PERCEPTIONS SCALE SCORES

Items	<i>M</i>	<i>SD</i>
1. Providing my professional opinion, I influence parents to vaccinate child against HPV	9.1	2.9
2. Providing information to parents, they will vaccinate child against HPV	8.9	3.1
3. See myself as a leader in providing HPV vaccine information in school community	8.5	3.7

APPENDIX E

TABLE OF PROFESSIONAL PRACTICE SCALE SCORES

Items	n	Factor	<i>M</i>	<i>SD</i>
1. Provided parents with information about HPV vaccination providers	406	I	1.7	0.84
2. Provided resources to parents about HPV vaccine	410	I	1.8	0.86
3. Provided students with information about HPV vaccination providers	401	I	1.5	0.79
4. Provided resources to students about HPV vaccine when students were in my office	404	I	1.6	0.83
5. Provided resources to students about HPV vaccine when students were outside of my office within the school environment	405	I	1.4	0.70
6. Provided resources to students about HPV vaccine whether or not students asked for resources	402	I	1.4	0.75
7. Had informational sheets about HPV vaccine in my office	412	I	2.3	1.20
8. Can provide health education to parents without violating school district policy	413	II	3.2	0.57
9. School district supports the health education I provide to parents	413	II	3.2	0.46
10. I can provide health education to students without violating school district policy	413	II	3.1	0.61
11. School district supports the health education I provide to students	413	II	3.2	0.31

Note: Factor I = Providing information and resources about HPV vaccine; Factor II = District supports professional practice regarding general health education