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Factors that influence HPV vaccinations in young women residing in Canada

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FACTORS THAT INFLUENCE HPV VACCINATIONS IN YOUNG WOMEN

RESIDING IN CANADA

by

Kristin A. Saunders

A Dissertation
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2012

Factors That Influence HPV Vaccinations in Young Women Residing in Canada

by

Kristin A. Saunders

APPROVED BY

_____

Dr. W. Fisher, External Examiner
University of Western Ontario

_____

Dr. D. Kane
Faculty of Nursing

_____

Dr. S. Bergeron
Department of Psychology

_____

Dr. C. Senn
Department of Psychology

_____

Dr. K. Lafreniere, Advisor
Department of Psychology

_____

Dr. R. Kent, Chair of Defence
Faculty of Graduate Studies

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Abstract

The HPV vaccine was first made available to girls and women in 2006. Despite support for the vaccine from health care professionals and governments, vaccination rates remain lower than anticipated. This study had two goals: (1) To investigate factors that predict actual and intended vaccinations, and (2) to test a model of HPV vaccination intentions. An adapted Health Belief Model was used as the theoretical framework to guide this study. The model components assessed in this study were: Perceived severity, perceived susceptibility, perceived barriers, perceived benefits, cues to action, self-efficacy, knowledge, and subjective norms. Each model component was assessed by at least one variable, with some model components being assessed with multiple variables. Participants were 374 women, aged 18 to 30, residing in Canada. Data were collected using an online questionnaire.

Logistic regression analyses revealed that actual vaccination decisions were directly influenced by the following model components and variables: Perceived severity (severity of treatment), perceived barriers (vaccine safety concerns, fear of doctor stigma, insurance coverage), and cues to action. Multiple regression analyses revealed that vaccination intentions were influenced by: Perceived benefits (vaccine positive beliefs, vaccine effectiveness), barriers (vaccine safety concerns), cues to action, self-efficacy, and subjective norms. A structural equation model to assess HPV vaccination intentions was tested. With a few modifications, support for the model was found. This model revealed that all of the theoretical components measured in this study contributed directly or indirectly to vaccination intentions.

This study revealed that actual and intended HPV vaccinations are predicted by different variables. In addition, it also found support for a complex model of vaccination intentions. A unique contribution was the finding that women's fear of experiencing stigma from doctors by asking for the vaccine impacted actual vaccination decisions. Vaccine safety concerns were also found to impact actual uptake. Finally, healthcare professionals may also benefit from understanding that cues to action were found to be predictive of behaviours, suggesting that women who are exposed to more cues are more likely to get vaccinated.

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Chapter I

Introduction

In 2006 the first vaccine for Human Papillomavirus (HPV), the common sexually transmitted infection (STI) that can cause genital warts and cervical cancer, was made available to girls and women in Canada and the USA (Gillison, 2008; Krishnan, 2008; McKaig, Barie, & Olshan, 1998; National Advisory Committee on Immunization , 2007). The announcement of the release, and subsequently, of government plans to begin mass school-based vaccination programs for girls, was not met with unanimous public support. Instead, many news stories and internet communications about the vaccine were negative in tone, describing possible risky side-effects and fears about the influence of the vaccine on teen sexual behaviour. Media titles about the HPV vaccine included: *Our girls are not guinea pigs: Is an upcoming mass inoculation of a generation unnecessary and potentially dangerous*? (Gulli, 2007), *Experts raise worries about HPV vaccine* (ctv.com, July 2007), *Schoolgirl dies after cervical cancer vaccination* (Adetunji, 2009), and *Defusing the War Over The "Promiscuity" Vaccine* (Gibbs, 2006). It should be noted that an inquiry into the death of the school-aged girl from the United Kingdom revealed that she did not die as a result of the HPV vaccine.

Although many initial media stories about the HPV vaccine were negative, the benefit of vaccination is widely recognized by health professionals. School-based vaccination programs are offered in every province in Canada, and public health departments continue to support the vaccine. For instance, the Public Health Agency of Canada and the US Department of Health and Human Services both endorse the HPV vaccine on their websites. To combat negative media stories about the vaccine, Canada's

Chief Public Health Officer issued a public statement refuting a negative story published by MacLean's magazine (Public Health Agency of Canada, 2007). Although the negative public discourse about the HPV vaccine eventually ceased, HPV vaccination rates have not reached anticipated goals in some school based programs in Canada, and very few women outside of school based programs have been vaccinated. Why?

Although health professionals may recognize the benefits of HPV vaccination, the general public may not. While HPV is a common STI that infects approximately 50-80% of individuals at some point in their lifetime (Henderson, Yasgur, & Warshowsky, 2002; National Advisory Committee on Immunization , 2007), individuals may not recognize the benefits of vaccination. This may be a result of the way in which the vaccine is promoted in popular advertisements, namely, as a defence against cervical cancer. A description of other benefits, such as protection from genital warts, is often lacking. Cervical cancer, however, is not a common illness within Canada. Approximately 1400 women are diagnosed with it a year, with 400 women dying from it (Health Canada, 1999). Because of these statistics (low in comparison to other cancers), girls and women in Canada may not feel susceptible, and thus may not feel that the HPV vaccine is necessary or beneficial.

For women who do recognize that they are at risk of HPV infection, and wish to avoid possible negative health effects, social and psychological factors may influence their actual vaccination behaviour. Women may want the vaccine but may have concerns about its safety, especially after the attention paid to this subject in the popular media. Related to the fear of negative side-effects, a general distrust of doctors or pharmaceutical companies may also influence perceptions of the HPV vaccine. If women distrust the

advice of those in the medical field, they may not be willing to act on their prompts to be vaccinated. In addition to these possible barriers, HPV's sexually transmitted infection (STI) status may also impede women from obtaining the vaccine. Because STIs are viewed negatively by society, women may be uncomfortable asking for a STI vaccine. While it is possible that these variables influence HPV vaccination decisions, research into some of these factors has not yet been conducted. Because of this, investigating how physician and pharmaceutical distrust, as well as comfort with sexuality and the STI status of HPV, influences vaccination decisions, was one of the main objectives of the current study.

Of course, in addition to these possible predictors of HPV vaccination decisions, past research has also investigated the relationship between HPV vaccinations and various other factors. These include: feelings of susceptibility to HPV infection (Kuitto, Pickel, Neumann, Jahn & Metelmann, 2010), a fear of needles (Gottvall, Larsson, Hoglund & Tyden, 2009), HPV knowledge (Woodhall et al., 2007), a fear of side-effects (Burke, Vail-Smith, White, Baker & Mitchell, 2010), perceived benefits of vaccination (Dempsey, Zimet, Davis & Koutsky, 2006), cost (Kahn, Rosenthal, Jin, Huang, Namakydoust & Zimit, 2008), feelings of self-efficacy (Buchanan, 2008; Kahn et al., 2008), and health care provider cues to action (Caskey, Lindau & Alexander, 2009).

While direct relationships between a host of predictor variables and HPV vaccination decisions have been examined in previous research, a comprehensive understanding of how the types of variables interact with each other to predict decisions is still lacking. Thus, another main objective of the current study was to develop a comprehensive understanding of these relationships. This was done by testing a

theoretically based model of vaccination intentions that included many of the variables

that had been used in previous research. To date, one of the most comprehensive

theoretically guided studies of HPV vaccination intentions was conducted by Buchanan

(2008) for her dissertation. She compared two theoretical models, the Health Belief

Model and the Theory of Planned Behaviour, to see which would better explain HPV

vaccination intentions. Her sample was comprised of American university students, and

the study was conducted soon after the release of the vaccine. Buchanan found that an

integrated model that used variables from each theory was actually more predictive of

intentions than either theory alone. While Buchanan's research was a good first step to

developing a model of HPV vaccination decisions, in her study the components of each

model were simply tested to see if they had direct relationships with the outcome

variable. How the various model components may influence each other was not

investigated. In order to build upon this, the current study took the testing of a theoretical

model one step further, by developing and testing a more complex model of the decision

process.

In summary then, the objectives of this study were to investigate factors related to

actual and anticipated vaccinations in a sample of young women residing in Canada.

Direct relationships between possible predictor variables and vaccination outcomes were

investigated. In addition, a proposed model of HPV vaccination intentions was tested.

While these were the main objectives of this study, this study also makes an important

contribution to the area of HPV research because it is one of the first studies to be

conducted in Canada with young adult women. Because many studies have been

conducted in the US, where the health-care system is different from Canada, and where

the cultural values of some segments of society may be quite different, it will be advantageous to investigate possible predictors of HPV vaccinations in Canada. Finally, this study was also important because of the timing of this research. Many earlier studies about the HPV vaccine had to investigate intentions to vaccinate because they were conducted prior to the release of the vaccine. Because the vaccine had been available for five years at the time this study was conducted, actual vaccination behaviours, as well as intentions, were able to be investigated.

Background: What is Human Papillomavirus (HPV)?

Human Papillomaviruses are a family of over 100 viruses, at least 40 of which have been found to infect the genital region (National Advisory Committee on Immunization, 2007). Genital HPV infection can lead to the development of genital warts when individuals are infected with *low risk* strains such as types 6 or 11, or abnormal changes in squamous epithelial cells, such as the skin or mucosae, that can lead to certain genital and head and neck cancers when people are infected with *high risk* strains such as types 16 and 18 (Henderson, et al., 2002; National Advisory Committee on Immunization, 2007).

Prevalence. HPV is often cited as the most common STI in the world, with 50 to 80% of people being infected with it at some time in their lives (Henderson, et al., 2002; Krishnan, 2008; National Advisory Committee on Immunization, 2007). Canadian studies have found that the proportion of women infected with HPV at any one time is estimated to be between 10 - 29%, although studies have found that rates vary by region, age and ethnicity (National Advisory Committee on Immunization , 2007). Sellors et al. (2000), in a study investigating HPV infection rates in Ontario, found that 24% of women

aged 20 to 24 had HPV, with the rate declining as women aged. For example, 16.4 % of women aged 25 to 29 had HPV, 12.3% of those aged 30 to 34 had it, and 9.6% of women aged 35 to 39 were positive for HPV. Data were presented for women up to the age of 50. Another study, conducted in Montreal, examined rates of infection for both high risk and low risk strains of HPV. The study found that 21.8% of young women had high risk HPV infections, and 14.8% had low risk infections (Richardson et al., 2003). The women in this sample had a mean age of 23 years. Although the HPV virus can be found in many women, the majority will never notice that they are infected. In most cases the virus spontaneously clears the body without causing any adverse physical effects (Krishnan, 2008; The Society of Obstetricians and Gynaecologists of Canada, 2007). However, a proportion of women and men will go on to experience physical symptoms of HPV infection.

Within Canada, studies investigating the prevalence of genital warts are lacking, although a study in Ontario found that 1.1% of women who attended health clinics had genital warts (National Advisory Committee on Immunization, 2007; Sellors et al., 2000). Rates from the United Kingdom and the United States of America estimate that approximately 1.5 people per 1000 have them. Younger individuals are more likely to have genital warts. For instance, six in 1000 women aged 20-24, and five in 1000 men aged 25-29 were found to have genital warts (National Advisory Committee on Immunization, 2007). For most individuals, the condition resolves within one to two years, although the virus can remain in the body indefinitely, making future outbreaks possible (National Advisory Committee on Immunization, 2007).

When looking at cervical dysplasia and cervical cancer in particular, Henderson, et al. (2002) reported that 10% of women infected with high risk HPV strains will go on to develop abnormal cervical cell changes. The Canadian Women's Health Network (2007) states that 8% of the 4 million Pap tests done in Canada each year (approximately 325,000) require follow-up due to abnormal results. From the time risky (high grade) cell changes begin, it can take up to 10 years for cervical cancer to develop. However, in a small minority of cases, cervical cancer can develop very quickly, in less than a year (National Advisory Committee on Immunization, 2007). Cervical cancer normally peaks in women in their 40s, and then again over the age of 70 (National Advisory Committee on Immunization, 2007), although the Public Health Agency of Canada (2009) notes that 67% of cervical cancer occurs in women aged 30-59. In Canada in 2001, approximately 1450 cases of cervical cancer were diagnosed, and 420 women died (Shah, 2003). Fortunately, the treatment for cervical cancer, if caught early, is quite effective. For those women diagnosed with cervical cancer, 74% will still be alive five years post-diagnosis (Public Health Agency of Canada, 2009). This is a result of the various types of treatment that are available to women who are diagnosed, such as chemotherapy, radiation, and hysterectomy.

Pap testing has also been a powerful tool to prevent deaths from cervical cancer. Since Pap testing began in the 1960s, rates of cervical cancer have declined greatly. Regular Pap smear testing allows cervical cell changes to be detected early on, in most cases before the development of cancer. Unfortunately, not all women obtain regular Pap testing, so some women remain at risk for developing cervical cancer. There is also a

small minority of women who develop cervical cancer very quickly, before pre-cancerous cell changes can be caught through tests.

Reactions to HPV infection. While regular testing can allow the majority of women to avoid the most severe outcome of an HPV infection, it does not protect women from other negative effects such as psychological distress and potentially painful treatments. Research into women's reactions to being told they have HPV or an abnormal Pap smear test has shown that the majority of these women experience adverse psychological reactions such as anxiety and distress (Biro, Rosenthal, Wildey & Hillard, 1991; Doherty, Richardson, Wolfe & Raju, 1991; Juraskova, Butow, Sharpe & Campion, 2007; Karasz, McKee & Roybal, 2003; McCaffery, Waller, Forrest, Cadman, Szarewki & Wardle, 2004; Perrin et al., 2006). For example, in a study of English women attending a colposcopy clinic after an abnormal Pap test (N=102), 90% of participants reported feelings of fear and worry as an initial response, while 67% reported feelings of depression (Gath, Hallam, Mynors-Wallis, Day & Bond, 1995). A recent study conducted in Canada also found that women had negative reactions to abnormal Pap smears (Drolet et al., 2012). This study found that 46% of women with an abnormal test felt anxiety/depression, with 35% of women still having clinically significant anxiety 12 weeks after diagnosis (Drolet et al., 2012).

Women's sexuality has been found to be greatly impacted by HPV infection in a negative fashion, with some women reporting a decreased desire to have sex (Biro, Rosenthal, Wildey & Hillard, 1991; Campion, Brown, McCance, Atia, Edwards, Cuzick & Singer, 1988; Gath, Hallam, Mynors-Wallis, Day & Bond, 1995), decreased sexual enjoyment (Filiberti, Tamburini, Stefanon, Merola, Bandieramonte, Ventafridda & De

Palo, 1993; Gath, Hallam, Mynors-Wallis, Day & Bond, 1995), and less arousal and orgasm (Campion, Brown, McCance, Atia, Edwards, Cuzick & Singer, 1988). In addition, some women who have received medical treatment of the cervix report discomfort during sex and increased negative feelings toward sex, even five months after diagnosis and treatment (Campion, Brown, McCance, Atia, Edwards, Cuzick & Singer, 1988).

Perceptions of past and future sexual or romantic partners are also influenced by diagnosis. For example, women who had abnormal Pap tests reported feeling worse about past sexual relationships after they were diagnosed with HPV (McCaffery, Waller, Forrest, Cadman, Szarewki & Wardle, 2004). In another study, a worsening of the emotional relationship between romantic partners was reported (Filiberti et al., 1993). Not only are perceptions of past relationships tainted by diagnosis, but fear for future relationships is also reported as a concern of patients by college health care providers (Linnehan & Groce, 1999).

Fear of developing cancer is also a common reaction after an abnormal Pap test or HPV diagnosis (Gath, Hallam, Mynors-Wallis, Day & Bond, 1995; Juraskova, Butow, Sharpe & Campion, 2007; Karasz, McKee & Roybal, 2003; Maissi, Marteau, Hankins, Moss, Legood & Gray, 2004). Interviews with women who had cervical abnormalities found that before treatment, 16 of the 21 women interviewed had fears about the possibility of developing cancer (Juraskova, Butow, Sharpe & Campion, 2007). These fears remained post-treatment for nine of the women, indicating that treating the immediate threat does not ease some women's worries. Health care providers also

recognize that their patients experience a fear of cancer, with providers reporting that patients communicate these fears to them (Linnehan & Groce, 1999).

In addition to negative psychological reactions, women also experience concerns related to their physical bodies. For example, women experience fears of HPV treatment (Doherty, Richardson, Wolfe and Raju, 1991), and concerns that the virus will negatively affect their fertility (Juraskova, Butow, Sharpe & Campion, 2007). These concerns are justified, as medical treatments can be uncomfortable and painful. In addition, knowledge that the health of the cervix may be compromised, now or in the future, would not surprisingly cause women to ponder about future childbearing.

As the above research highlights, women have multiple negative reactions to being diagnosed with HPV or having an abnormal Pap test. Thus, while Pap testing is an important and vital component of ensuring women's health, a vaccine that would enable women to avoid HPV infections altogether would ensure that women do not have to experience these varied negative reactions to symptomatic infections and treatment. It is important to recognize that many of the negative reactions that women have to diagnosis are likely related to HPV's STI status. While previous research has not investigated this link, the current study examined whether a relationship does exist. Findings from HPV research that has found that women feel anxious and depressed after diagnosis, and that they have concerns about past and future relationships, may indirectly demonstrate how the stigma of STIs negatively influence women.

Risk factors. There are various risk factors that are associated with HPV infection. Demographically, groups of women in Canada who tend to have the highest rates of infection are younger women (with highest rates for men and women under the

age of 25) and Aboriginal women (Krishnan, 2008; National Advisory Committee on Immunization, 2007). For all women, factors that are related to an increased risk of contracting HPV are: number of lifetime sexual partners, having unprotected sex, engaging in activities that lead to sexual risk taking (e.g., substance abuse), younger age at first intercourse (through its link to number of partners, cervical development, and risky behaviours), and having a sexual partner who has had multiple partners (Henderson, et al., 2002; Krishnan, 2008).

Unfortunately, knowledge of these risk factors does little to decrease the stigma of individuals infected with an STI. A girl or woman reading these risk factors may notice that they describe behaviours typically labelled as amoral by society. In order to avoid association with a group often deemed undesirable, girls or women may tell themselves they are not at risk of HPV infection, thus having an impact on their desire to obtain the vaccine. In addition, if women do recognize that they are at risk of HPV infection, be it regular risk or high risk, they may be reluctant to ask for a vaccine for a virus known to infect those who engage in risky sexual behaviours more frequently. To do so may be to open oneself up to experiencing stigma.

Disadvantaged women. Individuals who are socially disadvantaged experience an increased incidence of various diseases, cervical cancer included (Raphael, 2009). The over-representation of poor, rural, isolated, under-educated, immigrant, and/or minority women (McGibbon, 2009; Rimer, McBride and Crump, 2001; Shah, 2003; Tiersma et al., 2004) in those who are diagnosed with cervical cancer, or more severe forms of cervical dysplasia, highlights how social determinants of health impact these women. Women who belong to one or more of these groups may have limited access to appropriate or

reliable health care, and they may have a limited ability to engage in health promotion

and protection activities. For example, African American women were found to be

diagnosed with cervical cancer at a later stage, to be less likely to receive treatment in

comparison to Caucasian women, and to be more likely to die as a result of cervical

cancer (McGibbon, 2009). Sadly, the factors that contribute to disadvantaged women's

lack of Pap testing are also likely to have an impact on their ability to obtain the HPV

vaccine. This argument is often made to demonstrate how the HPV vaccine will not

necessarily save the lives of women living in Canada or the USA. While this is an

important point that must be addressed, be it with more funding for Pap testing for

disadvantaged women or free HPV vaccinations for those in need, the importance of the

HPV vaccine in protecting women's health should not be dismissed.

Background: The HPV Vaccine

So far, this paper has discussed the HPV vaccine without providing detail about

when it was developed and vaccination goals. The first HPV vaccine was released for

females in 2006. In 2010 it was also approved for males. The vaccine protects against 4

strains of HPV that cause 70% of cervical cancers and 90% of genital warts (Krishnan,

2008). In Canada, the vaccine was first approved for girls and women aged nine to 26,

and the National Advisory Committee on Immunization recommends that women up to

the age of 26 be vaccinated (2007). The Public Health Agency of Canada (2011)

"recommend[s] the vaccine for females 14 to 26 years of age as there still is the potential

for benefit regardless of previous sexual activity, Pap abnormalities, cervical cancer,

anogenital warts or a known HPV infection." Currently, grade eight girls in Canada may

receive the HPV vaccine for free. Outside of grade eight, other girls and women are

responsible for payment of the three-dose vaccine, either personally or through their insurance providers if they are eligible.

The vaccine has been widely touted by professionals as a promising tool to combat HPV infection. Initial models created to assess clinical population effects of widespread vaccination defined the best-case scenario as vaccination uptake levels of 70-100% of the targeted population (Dempsey & Mendez, 2010). It was assumed in initial modelling that these targets would be reached within a few years of vaccine introduction, although these goals may have been too idealistic given the nature of the vaccine and the target population (Dempsey & Mendez, 2010).

For an HPV vaccination program to be successful, the majority of girls and women (and now boys and men) must be vaccinated. Unfortunately, although many preliminary studies found that a majority of parents would approve the vaccine for their daughters, or that young women and girls believed that they would accept the HPV vaccine when it became available, actual vaccination rates are lower than expected.

Anticipated rates of vaccine acceptance. Prior to 2006, even though the introduction of an HPV vaccine was considered controversial in some circles, the majority of individuals for whom permission to vaccinate was required, namely mothers of daughters and young women, appeared to accept the idea of the vaccine, or to be open to learning more about it. For example, despite a general lack of public awareness of the impending availability of an HPV vaccine in 2003, a study conducted by Kahn, Rosenthal, Hamann and Bernstein (2003) found that the majority of study participants (52 young women with a mean age of 25) had positive attitudes toward an HPV vaccine, with 89% of them believing that it would be a good idea to get vaccinated. Jones and Cook

(2008) found similar high rates of acceptance. They examined the vaccination intentions

of male and female college students, and found that 88.6% of women and 77.5% of men

would get the vaccine (Jones and Cook, 2008). Kahn et al. (2008) found slightly lower

levels of acceptance with a younger sample. Their results indicated that 66% of their

sample of 409 sexually experienced girls and women aged 13-26 intended to get the HPV

vaccine. This lower rate is likely influenced by the responses of the younger girls in the

sample who may not be sexually experienced, and thus may not feel at risk for acquiring

an STI. The one Canadian study that examined HPV vaccine acceptance found similar

rates to those above, where 89% of their adult male and female sample would recommend

the HPV vaccine to daughters or nieces (Sauvageau, Duval, Cilca, Lavoie & Ouakki,

2007). A number of other studies have also found similar results (Brewer & Fazekas,

2007; Christian, Christian & Hopenhayn, 2009; Constantine & Jerman, 2007; Lenselink

et al., 2008; Marshall, Ryan, Roberton & Baghurst, 2007; Woodhall et al., 2007). As

previous research has demonstrated then, a majority of individuals reported that they

would accept or support an HPV vaccine. Unfortunately, perceptions do not appear to

predict real-world behaviours in this situation.

      Actual rates of vaccine acceptance. Although initial interest in the HPV vaccine

appeared positive, actual vaccine uptake rates after the 2006 release were surprisingly

low, ranging from 50-85% for school based programs and 10-30% for non-school-based

programs. Initial cost-benefit studies predicted vaccination uptake rates of 70-100%

within five years (Dempsey & Mendez, 2010; Kim & Goldie, 2008). Dempsey and

Mendez (2010) have described how various policy decisions impact uptake rates. They

predicted that with a mandated school-based program 70% coverage could be obtained in 8 years, but with no mandated program this rate would not be reached for 23 years.

Research has consistently found that acceptance rates do differ depending upon the setting/target group (i.e., school based programs versus non-school based programs). For Canadian school-based vaccination programs, rates of receipt range from 50% to 85% depending upon the province, with east coast provinces having the highest uptake rates and Ontario, Alberta and Manitoba the lowest (Canadian Women's Health Network, 2008; Graveland, 2009). In Canada, school-based vaccination programs for girls began in some provinces in 2007 and expanded into others in 2008. After the first year school-based vaccination programs were available in Nova Scotia, Prince Edward Island, and Newfoundland, uptake of the HPV vaccine was at 80% and above (Canadian Women's Health Network, 2008). Graveland (2009) reported that in Nova Scotia and Prince Edward Island rates were 80% for school-based programs, in Newfoundland they were 83%, and in Quebec rates ranged from 84-87%. Rates in Ontario were lower, where approximately 50% of girls received the vaccine through school-based programs (Graveland, 2009; The Canadian Women's Health Network, 2008). In the West, 66% of girls were vaccinated in British Columbia, while in Alberta and Manitoba 50-55% had received vaccines through school programs (Graveland, 2009).

Uptake among girls and women not eligible for school-based program is even lower than the lowest school-based rates, with only 10% to 30% of females obtaining the vaccine (Caskey, Lindau and Alexander, 2009; Gottlieb et al., 2009). For example, Caskey et al. (2009) conducted a large nationally representative study of American girls and women (n = 1011) and found that 30% of 13 to 17 year olds, and 9% of 18 to 26 year

olds reported that they had received at least one of the three required HPV vaccine shots. A smaller study of university women found that of 64 participants, only 4 had received the HPV vaccine and of those who had not been vaccinated, only 65% were interested in getting it (Gerend & Magloire, 2008). Not surprisingly perhaps, age influences HPV vaccine usage. Gottlieb et al. (2009) found that only 10% of their study sample had actually gotten the HPV vaccine, even though the sample was located in an area with elevated cervical cancer rates. Age was a factor, with 17.5% of 16-18 year olds getting the vaccine, compared to 6.4% of 10 to 12 year olds. As these results indicate, it is clear that non-school-based HPV vaccination efforts as they currently exist are largely ineffective at encouraging girls and women to obtain the vaccine (Rouzier & Giordanella, 2010).

Age, vaccine acceptance, and the current study. While the success of school-based HPV vaccination programs depends largely on the views and support of school boards and parents, grade-eight girls themselves are likely to have little decision-making power, or interest, in whether they receive the HPV vaccine or not. The group of women who have the most control over their own inoculation are those over the age of 18. While vaccination at younger ages (before girls are sexually active) is the most effective way to prevent HPV infection, promoting and vaccinating older girls and women can also be important. The Public Health Agency of Canada (2011) reports that while there is no official recommendation to vaccinate women over the age of 26, that the use of the vaccine for women over this age can still be considered.

In addition to the official age recommendations provided by governing health bodies, it is also important to understand the HPV vaccination beliefs and behaviours of

women in their twenties (and beyond), because of current societal dating and marriage

trends. Canadians are marrying later (Clark & Crompton, 2008), and thus dating longer,

suggesting that many women may still be exposed to new sexual partners well past their

26th birthdays. In addition, divorce is fairly common; consequently, women can find

themselves dating again at the end of a marriage or long-term relationship. The average

age of a second marriage is 39 years (Clark & Crompton, 2008). Although statistics on

cohabitation are not available, the divorce and dating pattern for individuals in common-

law relationships is most likely similar to that of individuals who marry, with some

statistics indicating that common-law relationships are even more unstable (Clark &

Crompton, 2008). As these statistics demonstrate, then, many women, including those

over the age of 26 or who may be deemed at low-risk due to their current relationship

status, can still benefit from the HPV vaccine.

In light of the need for women over the age of 18 to be vaccinated against HPV

infection, the current study examined the vaccination beliefs of women aged 18 to 30.

These are women who currently fall within the recommended vaccination age range of 14

to 26, or who did fall within this age range when the vaccine was first approved in 2006.

Vaccination in Canada: Conclusions. As the research described in the sections

above indicates, although intentions to become vaccinated against HPV appeared high

before the release of the vaccine, once it became available, actual rates of receipt were

lower than anticipated. While some school-based programs in Canada are effective

(obtaining over 80% vaccination rates), other school-based programs, and all non-school

based efforts, have been much less effective at encouraging the majority of girls and

women to obtain the HPV vaccine. The reasons for this lack of uptake need to be

investigated fully if the HPV vaccine is to be successful in protecting all women from HPV infections and their resulting negative physical and psychological effects. Gaining an understanding of the complex factors that influence the receipt of a vaccine for an STI is also important because other STI vaccines are also needed and in development.

It is evident that there are notable differences in HPV vaccination rates. Cost and ease of access appear to impact uptake rates as free, school-based programs are the most effective means of vaccine delivery. However, the variance observed between uptake rates by province, and even between women who are not eligible for school-based programs, indicates that factors more complex than cost and accessibility are at play. There are various psychological, social, and practical reasons for why some girls and young women do not obtain the HPV vaccine. These reasons are discussed in the following sections.

Distrust of the Medical Establishment and How it Can Impact Vaccinations

In the 1970s and 1980s, research on the growing distrust of the medical establishment began to appear (Betz & O'Connell, 1983; Shontz, 1974). Betz and O'Connell (1983) published an article discussing the growing distrust of professionals in North American society, stating that a Harris poll conducted in 1976 found that confidence in the medical institution declined from 72% to 43% between 1966 and 1975. Unfortunately, this distrust may still be present. Armstrong et al. (2006) found that distrust in the health care system is relatively high in the United States. Their sample was composed of 961 primarily Caucasian individuals, 80% of whom had health insurance. Eighty-two percent of their participants believed that people die every day because of mistakes made by the health care system, 58% believed that if a mistake was made in

their health care that the health care system would try to hide it, and 71% believed that there are ingredients in medicines that people are not informed about. While distrust in institutions or organizations appears to be high, Hall, Dugan, Zhang, Michra (2001) in their review of physician trust, have stated that individuals may have different perceptions of trust of individual doctors in comparison to health care systems or organizations. They report that "90% or more of patients express some level of trust in their physician, and two-thirds express strong trust" (p. 626). These researchers also note that in comparison to physicians, trust in health care establishments such as hospitals and insurance companies is lower. In light of these varying perceptions of trust, the current study examined participant perceptions of trust in physicians, as well as their trust in a larger health entity and key player in the vaccine industry, pharmaceutical companies. This was done in order to determine current levels of trusts in Canada, and whether perceptions of trust are related to HPV vaccination behaviours or intentions.

Medical distrust has been linked to various health related behaviours. A study that looked at the construct of trust in the healthcare system and the use of preventative medical services in a sample of 1681 older adults found that having trust in one's personal physician was related to use of preventative health services, with higher levels of distrust being associated with lower rates of health service usage (Musa, Schulz, Harris, Silverman & Thomas, 2004). Not only are levels of trust related to healthcare usage, but also to perceptions of actual health. One study found that distrust in the health care system was significantly related to worse self-reported health (Armstrong et al., 2006). As this research reveals, then, the concept of trust in the healthcare field is

important, as a lack of trust can be expected to lead to negative health outcomes, such as lack of vaccination behaviours.

How has medical distrust arisen? Betz and O'Connell (1983) proposed that distrust in doctors rose in the 1970s because the doctor-patient relationship had become more impersonal, short-lived, and specialized as individuals saw various doctors rather than relying on one family physician. The bureaucracy associated with medicine, as well as increased feelings of social distance and increased population mobility (and the result that many individuals do not know or have community connections to their doctors) were also discussed as contributing to increased physician distrust.

More recently, high-profile medical mistakes or adverse research findings may have had a negative impact on public perceptions of the medical establishment as well. For instance, stories about dangerous drugs or supplements such as the diet drug Fen Phen, which can cause heart damage; the diabetes medication Avandia, which also has been found to damage the heart; and Accutane, the acne medication which has now been linked to Crohn's disease and Colitis, may all impact the public's trust. One of the most high-profile and emotionally-charged health-related controversies however, is that of a proposed link between childhood vaccinations and autism. This controversy, along with its impact on vaccination rates and the anti-vaccine movement in general, will be discussed in the next section.

Anti-vaccine sentiment. The first vaccines were created over a century ago, and since that time immunizations have played an important role in maintaining population health, so much so that vaccines are touted as one of the most important medical advances in history to date (Link, 2005). Although the majority of individuals believe in

the benefit of vaccines (Heller, 2008), an anti-vaccine sentiment has gained popularity. Allen (2007), a writer and journalist, reports in his well-received book on vaccines that the latest controversy surrounding vaccines developed over the last decade. He reports that this was due to a number of factors: (1) the removal of a number of pharmaceuticals from shelves due to safety concerns, and a resulting suspicion of the safety of all pharmaceuticals, (2) distrust in those who regulate medicines, and (3) the popularity of the theory that the Measles Mumps Rubella (MMR) vaccine causes autism.

The idea that vaccines cause autism began in the late 1990s and gained popularity in the early 2000s (Allen, 2007). The idea came from a study that was published in the esteemed medical journal, the Lancet, in 1998. The study, led by Andrew Wakefield, stated that a possible link between the Measles Mumps Rubella (MMR) vaccine and autism may exist. In 2004, 10 of the original 12 authors of the article issued a statement in the Lancet that they wanted to retract the interpretation that there may be a link between the vaccine and autism from the original article (Murch et al., 2004). The journal article itself has since been retracted (The Editors of The Lancet, 2010), and in 2011, the British Medical Journal reported that the study was a deliberate fraud. Before the official retraction, various studies were conducted in order to investigate the possible relationship between vaccines and autism. One of these studies was conducted in Quebec, and like the others, found that no link exists (Fombonne, Zakarian, Bennett, Meng & McLean-Heywood, 2006).

While the Lancet article was eventually retracted, damage to the public's trust in vaccines had already been done. Some individuals now feared vaccinations and the potential side effects the public feared they could produce. Popular media both

propagated this fear and tried to calm it. Articles from popular media included titles such as: *An Epidemic of Fear: How Panicked Parents Skipping Shots Endangers Us All* (Wallace, 2009), *H1N1 Flu Shot: 3 Major Fears Debunked* (Biba, 2009), *The Autism Debate: Who's Afraid of Jenny McCarthy?* (Greenfeld, 2010), The *Vaccine-Autism link an Elaborate Fraud* (MacLeans, 2011), *Autism, Vaccines and Fear* (Wente, 2010), and *Swine Flu Fiasco: Everyone Needs the Vaccine. Few Plan to Get it. What you Need to Know. What You Need to Do* (Gulli, 2009). A Canadian study that was conducted to investigate attitudes toward vaccines found that while the majority of respondents had positive views of the effectiveness of vaccines, 62% of participants were reluctant to dismiss anti-vaccine positions (Ritvo et al., 2003). Surprisingly, 45% of participants reported that they did not have enough knowledge about the safety of vaccines to comment on the topic. The authors noted that participants' lack of knowledge about vaccines may cause them to be susceptible to anti-vaccine messages, a concern they believed public health should take seriously in the event of an emergency that would require vaccinations.

Not only have some people internalized fears about vaccines, but actual behaviours have also changed. Some countries experienced actual drops in vaccination rates. For instance, in the USA in the early 2000s only 2% of parents refused to vaccinate their children, but throughout the 2000s vaccination rates decreased in some areas, with vaccine exemption rates in some communities doubling and tripling (Allen, 2007). For example, by 2004, vaccination rates in one Colorado community had fallen so much that 1200 cases of Whooping Cough were reported, the highest rate of the illness since 1964 (Allen, 2007). The United Kingdom also experienced drops in immunization rates. In the

mid-nineties the vaccination rate for the MMR vaccine was above 90%. This fell to a low of 80% in 2003-2004, although it is currently increasing again (rates were 88% for 2009-2010). Rates have yet to reach their mid-1990s levels however, or the World Health Organization goal of 95% uptake (National Health Service, 2010). In Canada, while drops in childhood immunization rates haven't been as large as those of the USA., England, or Ireland for example, immunization rates for many viruses and illnesses are still lower than target levels. The Influenza vaccine, for instance, while becoming more popular over the last decade, was still only obtained by 34% of the population in 2005 (Statistics Canada, 2008). During the H1N1 vaccine program of 2009, when all Canadian's were urged to obtain the vaccine for this particularly severe flu strain, only 41% of Canadians were vaccinated (Gilmour & Hofmann, 2010).

Research has been conducted to investigate how fears of vaccine safety and distrust in the medical establishment influences immunization decisions. Prislin, Dyer, Blakely and Johnson (1998) conducted in-person interviews with 4832 parents. They found that while external barriers (e.g., cost, logistical considerations) play a part in influencing whether parents have children vaccinated, factors such as beliefs about natural immunity, distrust of health professionals, and vaccine safety concerns also play a role. Research has also revealed a potential paradox, where individuals believe in medical science, but distrust health professionals. Gullion, Henry and Gullion (2008) conducted interviews with 25 parents who consciously chose to forgo or delay childhood vaccinations. Themes that arose from these interviews showed that parents place a high value on scientific knowledge, while at the same time voicing their distrust of the medical community. Some participants reported that they were suspicious of the reasons

physicians supported vaccines, stating that they believed doctors had specific agendas such as being rewarded financially. Some participants also mentioned that they do believe that physicians have good intentions, but that they are too busy to stay current with new medical developments. Thus, these parents believed that by doing their own research they could gain more knowledge about vaccinations than their physicians. To explain this distrust, the authors of the study discussed the current nature of physician visits. They are often short, and physicians do not have time to devote to explaining medical procedures or decisions. This means that individuals often do not have their medical information needs met, resulting in fears or concerns that are not addressed by doctors (Gullion, Henry and Gullion, 2008). Because of this, individuals begin seeking out their own medical information.

Fear of the HPV vaccine. Given the anti-vaccine sentiment that grew in the 2000s, it may not be surprising that when the HPV vaccine was released in 2006 that it was met with controversy and fear by some. As the media articles mentioned earlier in this document highlight, some individuals feared potential side effects from the HPV vaccine, and others feared its impact on girls' sexuality. When beliefs about the safety of the HPV vaccine were actually investigated, it was found that while a majority of individuals believe the vaccine is safe, a portion of people are uncertain. For example, a study by Rosenthal et al. (2008) found that 57% of parents agreed that the HPV vaccine was safe, 33% were unsure, and 10% did not think that it would be safe to give to their children. In another study of 52 women aged 18 to 30 that investigated factors associated with HPV vaccination, 75% of the sample reported that they believed the HPV vaccine was very or extremely safe (Kahn, Rosenthal, Hamann and Bernstein , 2003). This

suggests that 25% of the sample were either uncertain, or did not believe this. Concerns about HPV vaccine safety, if administered to the self or a daughter, were also found in others studies where the rates of participants who had safety concerns were 24% (Caskey, Lindau & Alexander, 2009), 7% (Constantine & Jerman, 2007), and 5% (Marshall, Ryan, Roberton and Baghurst, 2007), and the rates of concern about side-effects were 66% (Marshall et al., 2007). A Canadian study conducted in British Columbia that investigated predictors of school-based HPV vaccine acceptance found that fear of the safety of the vaccine was a predictor of parent's decisions to have their daughters' vaccinated, with 29.2% of the sample reporting this as a reason for not having their daughter vaccinated in the school-based program (Ogilvie et al., 2010).

While concerns about the safety of the HPV vaccine may be related to fears of vaccines in general, concerns about sexuality, or other factors, the newness of the HPV vaccine and thus a lack of data on side effects may have contributed to the relatively high rates of concern reported for this specific vaccine. In fact, in a study of parental attitudes towards HPV vaccination, Gerend, Weibley and Bland (2009) found that 50% of the parents in their sample of 82 individuals felt reluctant to give the new HPV vaccine to their daughters. They reported that they would feel more secure if the vaccine had been safely on the market for three years or longer. The current study was able to investigate if concerns about vaccine safety impact HPV vaccinations, along with an examination of the many other factors that may influence vaccine uptake.

While it is obvious that concerns about the vaccine do exist, do such concerns actually influence uptake? Research has examined how a fear of side effects influences HPV vaccination behaviours, and some studies have found that concerns do influence

acceptance (Kahn et al., 2008; Woodhall et al., 2007). For instance, a study by Woodhall et al. (2007) found that of 727 parents surveyed, of those who were resistant to having their child vaccinated, 13% rated their concern about the safety of the HPV vaccine as high, and 57% rated their concern as medium. Kahn et al. (2008) also conducted a study investigating HPV vaccination rates and factors that influence intentions to receive it. Their sample was comprised of 409 sexually experienced women aged 13 to 26. Questionnaires assessed HPV vaccination history, demographics, behaviours, knowledge, beliefs, and gynaecologic history. The results of the study indicated that only 5% of the sample had received one of the HPV vaccine shots and that various factors were related to future HPV vaccination intentions. Concerns about the safety of the vaccine was one factor. Others included practical barriers like cost, knowledge, norms, and perceived severity and benefits. While it is obvious that concerns about side effects influence acceptance of the vaccine, it is important that other possible concerns also be investigated. Concerns that were investigated in the present study include: trust in physicians, trust in pharmaceutical companies, concerns about the STI status of the vaccine and associated stigma, along with many other variables.

It is important to note here, that the safety of the HPV vaccine has been widely demonstrated through research (Harper et al., 2006; Munoz, 2009). In a study conducted by Medina et al. (2010), 1035 girls from 12 countries were administered the HPV vaccine, while 1032 girls were administered the hepatitis A vaccine. The hepatitis group was used as a control group. The HPV vaccine was not found to lead to more serious adverse event reports than the hepatitis vaccine. Only one reported adverse event from the HPV group was deemed to be related to vaccination. This reaction was a urinary tract

infection in conjunction with elevated liver enzymes (the participant recovered). Other

serious medical events that were reported by the HPV group were not related to

vaccination, as any adverse medical event that occurred in the months after vaccination

was recorded. These serious adverse events included things such as: pneumonia,

enterobiasis, gastroenteritis, upper respiratory tract infection, gunshot wound,

dehydration, abdominal pain, bronchitis, and injury. Individuals in the HPV group did

report more headache, fatigue, muscle pain, and rash than those in the control group,

however.

   Distrust and safety concerns and the current study. In summary, the goals of

the current research as they pertain to the concept of medical distrust, included an

examination of: (1) perceptions of the safety of the HPV vaccine, (2) beliefs in the

trustworthiness of physicians, and (3) beliefs in the trustworthiness of pharmaceutical

companies, and how these variables were related to HPV vaccination decisions.

The STI Status of HPV And How It Can Impact Vaccination

   When investigating factors that impact HPV vaccination behaviours, it is

important to recognize that the HPV vaccine is not just a *regular* vaccine. The sexually

transmitted nature of the human papillomavirus means that there are unique social and

psychological factors tied up in perceptions of the vaccine. As Casper and Carpenter

(2008) state in their examination of the HPV vaccine and notions of sexuality, the HPV

vaccine "provokes longstanding controversies swirling around sex, gender and women's

bodies" (p.896). While little research has examined how the sexually transmitted nature

of the human papillomavirus influences actual vaccine acceptance, it is likely that factors

such as STI stigma and shame, embarrassment, and sexual comfort or discomfort may

influence actual or anticipated HPV vaccine receipt. It is important to note that Zimet, Liddon, Rosenthal, Lazcano-Ponce and Allen (2006), reported in their review of factors that influence vaccinations that the STI status of the HPV vaccine should not impact uptake. They based this belief on research that investigated young adults' interest in the vaccine and the finding that a large majority of youth were interested in obtaining it, even when it was described as an STI vaccine. We now know, however, that HPV vaccine uptake has not reached anticipated levels. It is the belief of this author that the STI status of HPV does have an impact on participants' vaccination decisions.

Heller (2008) outlined the unique challenges that face vaccines for sexually transmitted infections in a discussion about the potential development of an HIV vaccine. He outlined how negative social perceptions about HIV and the "type" of people who acquire it, hampers public support for HIV preventative measures such as a vaccine. Because of the manner in which HIV is spread, either through unprotected sexual contact, intravenous drug use, or blood transfusions, individuals infected with it are blamed for their infections, Heller notes (2008). While part of the negative reaction to the HIV vaccine is likely related to homophobia, as HIV was first described as a disease of gay men, stigma is associated with all STIs, due to the sexually transmitted nature of the viruses, and the perceptions of the people who get them. Because of this, vaccines for any STI may face backlash. For example, Allen (2007) described how protests of school-based Hepatitis vaccination programs arose in the 1990s. Religious organizations and their supporters protested the use of the vaccine, in part due to its status as a virus that could be spread by sex or intravenous drug use (Allen, 2007).

Due to the negative perceptions that people have of STIs, there are likely various barriers that impede individuals from wanting to obtain a vaccine for an STI. First, people may not believe they are at risk of STI infection because they think that they are not the "type" of person who would get an STI (e.g., promiscuous, risky, likely to have infected partners). Second, individuals may blame those who do acquire STIs for their own infections, and thus may not support preventative measures. Third, even if individuals do believe in STI vaccination and that they are at risk for acquiring an STI, they may fear stigma from health professionals, friends or romantic partners if they obtain the vaccine. And finally, individuals may simply be too embarrassed to discuss sexually related topics with healthcare providers. As this list demonstrates, there are many STI-related reasons why an individual may not want the HPV vaccine, or may not feel comfortable asking for it. While all individuals in North American society do not hold prejudicial attitudes towards sex, STIs, or those who are infected with them, prejudices are held by some individuals, and thus fears of STIs and associated stigma abound. Research findings concerning STI associated stigma will be discussed next.

STIs, stigma and shame. Research has consistently found that STIs are viewed negatively. For example, Smith, Mysak and Michael (2008) conducted a study using vignettes that described the diagnosis of a target with either a sexually transmitted infection or another illness, in which symptoms and prognosis were held constant. Results indicated that targets who were described as having a STI were rejected more by study participants. Interestingly, although gender was hypothesized to influence target perceptions, with women being perceived more negatively, no differences were found. The authors note that this is in line with more recent research, and may indicate that

sexual double standards are decreasing. Thus, STI stigma is a concern for both men and women. Another study, conducted by East, Jackson, Peters and O'Brien (2010) using online interviews, also found that participants admitted to viewing those who had STIs negatively, even though the participants had recently been diagnosed with an STI themselves. The study authors proposed that these individuals were experiencing self-blame and shame, and were attempting to deal with their diagnosis by denying and minimizing their infections to themselves and to others (and thus not identifying with others who have STIs). Some participants did indicate that they felt shame because of their infection, and that it lead to their denial.

Feelings of stigma and shame by those infected with STIs were also found in other studies. In an interview study of 60 individuals with either HPV or Genital Herpes that was conducted to investigate the impact of STI infection on individuals and their relationships, the majority of participants stated that "the stigma associated with having an STI made them feel depressed, sad or upset" (Newton & McCabe, 2008, p. 866). Consistent with the Newton and McCabe study that had a sample in which half of its members had HPV (30 individuals had HPV, and 30 had herpes), other studies investigating perceptions of HPV infection have also found that individuals do perceive an HPV infection as stigmatizing (Kahn et al., 2007; Perrin et al., 2006).

The negative associations that individuals hold of STIs and the people who get them are not only detrimental because of the psychological and social effects they have on individuals, but also because these STI fears can act as a barrier to seeking STI testing or treatment, and thus may lead to negative physical outcomes as well. For example, a study of 594 youth revealed that youth who view STIs as stigmatizing have a decreased

likelihood of being tested for STIs (Cunningham, Kerrigan, Jennings & Ellen, 2009). This finding was true for both males and females. Interestingly, this relationship was not found when perceptions of STIs as shameful were assessed in this study. However, Cunningham et al. noted that shame was found to influence STI testing in another study. Similar results were also found in a large study (N = 1973) by Fortenberry et al. (2002), who found that feelings of STI stigma and shame acted as barriers to STI testing, although STI stigma appeared to have the largest influence. A relationship between stigma and STI testing was also found by Barth et al. (2002). They investigated factors that influenced whether youth would seek STI testing and found that a fear of stigma was one of the reasons individuals did not get tested. More specifically, participants reported that they feared being perceived negatively by others (e.g, as dirty, stupid, or loose), being embarrassed or gossiped about, and feeling shame, guilt or other negative emotions. Finally, Balfe et al. (2010) conducted interviews with 35 Irish women, asking about perceptions of individuals with an STI. Participants viewed women with Chlamydia, or who needed testing for Chlamydia, as irresponsible and sexual risk-takers, quite different from how the participants viewed themselves, indicating that people who acquire STIs are *others*. Participants viewed being tested for Chlamydia negatively, and reported that doing so would open them up to stigma and social ostracism. To participants, not getting tested for the STI was a positive thing which enabled the women to maintain their sense of being a "good" person. As the research outlined above exhibits, negative perceptions of STIs do influence whether individuals will undertake preventative health measures (e.g., STI testing, STI vaccinations).

Even when the time for prevention has passed and treatment is needed, fear and stigma may still lead to a lack of treatment seeking. For example, Lichtenstein (2003) conducted focus groups with 42 participants to investigate how STI related stigma impacts individuals' willingness to seek treatment in the southern USA. Findings from the focus groups confirmed that STI related stigma did impact participant willingness to seek treatment for STIs. Four types of stigma concerns were revealed in the focus groups. Individuals feared stigma because of: religious reasons, concerns about their privacy, fears of being the target of gossip, and concerns having to do with race. As this study demonstrates, STIs and how they are perceived by society has a very large impact on individual behaviour.

Sexual comfort, sexual activity, and the HPV vaccine. While the stigma and shame associated with STIs is widely shown to influence STI-related health behaviours, it is likely that other sexually related factors such as comfort with sexual communication and conservatism also influence sexual health behaviours, and thus HPV vaccine acceptance. Comfort communicating with a health professional about the HPV vaccine may be important for women who want to obtain the vaccine. When speaking with health care providers, the topic of the vaccine may also come up in conjunction with conversations about other sexual behaviours, and thus comfort engaging in these conversations may prove to be important to HPV vaccine acceptance. Research that has investigated comfort discussing sexuality and STI vaccine behaviours is limited. However, Gamble, Klosky, Parra and Randolph (2010), wrote a review article about factors associated with family HPV vaccine decision-making. In it they recognized that sexual communication may be an important factor related to HPV vaccine acceptance. In

their article, their discussion focused on parent-child sexual communication, and how comfort in engaging in this type of talk is important for adolescent sexual health. They recommended that more research be conducted in this area.

Conservatism may influence how individuals feel about sex and STIs in general. For instance, sexual and social conservatism were found to be associated with higher scores on STI stigma and shame measures in a Canadian study of 218 male and female university students (Foster & Byers, 2008). Sexual conservatism has definitely been found to influence some parents' perceptions of the HPV vaccine. When the HPV vaccine was released in the USA in 2006 conservative parents protested, often stating that mandatory vaccination of young girls was immoral and compromised family values (Krishnan, 2008). Opponents to mandatory HPV vaccine programs stated that because the virus is spread sexually, and not through uncontrollable transmission methods like surface germs or sneezing, that parents should have the choice to vaccinate their children. For parents with sexual concerns, one of the most publicized criticisms of the HPV vaccine was the belief it would encourage teen girls to have sex or to be promiscuous, either because having parents approve an STI vaccine would be seen as synonymous with giving consent for sex, or because teens would believe that they were now protected against other STIs as well.

In light of the controversy surrounding the HPV vaccine launch, researchers investigated whether parents and youth really did believe that the HPV vaccine would increase sexual activity, and whether these beliefs would influence decisions to vaccinate. A Canadian study comprised of 471 adults aged 19 to 69 investigated various demographic factors associated with Pap testing and HPV vaccine beliefs and practises.

When results were examined, it was found that 12% of individuals believed the HPV vaccine would encourage early sexual activity, and that 19% of individuals somewhat believed that it would (Sauvageau et al., 2007). Luckily, in spite of these beliefs, 89% of the sample would recommend the vaccine to their daughters or nieces. Interestingly, this study found that opinions about the influence of vaccine receipt on sexual activity varied with age (Sauvageau et al., 2007). Older individuals were more likely to believe that the vaccine would encourage an earlier onset of sexual activity than did younger individuals, with 19% of male and female participants under the age of 30 believing that the vaccine would encourage earlier sex, and 47% of participants aged 60-69 believing it would do so. Other studies have also found that some individuals believe that HPV vaccinations would encourage early sexual activity, although these individuals are usually the minority. A study that looked at factors associated with HPV vaccine acceptance in a sample of California mothers found that 18% of their sample would not vaccinate their daughters, and that of these mothers, 11% would not vaccinate their daughters because they had either moral or pragmatic concerns about the effect vaccination would have on their daughters' sexual behaviour (Constantine & Jerman, 2007). The majority of study participants (75%) did support immunization by age 13 however, and stated they did so for health and safety reasons. A study by Bernat et al. (2009) found a similar proportion of parents who believed that the HPV vaccine would impact sexuality. They found that 12.8 % of parents believed that the HPV vaccine would cause increased sexual activity. Marshall, Ryan, Roberton and Baghurst (2007) also found similar results, with 5% of their Australian parent sample (N = 2002) reporting concerns about the HPV vaccine leading to promiscuity.

Although research does show that a small proportion of individuals believe that the HPV vaccine will impact sexual behaviour, it does not show that it increases sexual activity in youth or that vaccination leads to risky sexual practices (e.g., not using condoms, not getting Pap tests). Kahn, Rosenthal, Hamann and Bernstein (2003) studied 52 young women between the ages of 18 and 30, and found that most of their study participants reported that they would not engage in more risky sexual behaviours if they got the HPV vaccine. Related to this, after the release of the HPV vaccine, Caskey, Lindau and Alexander (2009) conducted a study of 1011 women. In order to investigate perceptions of the HPV vaccine, participants were asked a variety of questions about it. When asked about the need to use condoms after vaccination, women who had received the vaccine correctly responded in 98% of cases that condoms were still necessary. Meanwhile, 18% of non-vaccinated women did not know if women would need to use condoms after vaccination or not. When asked about the need to get Pap tests after vaccination, 19% of women who had been vaccinated were not sure if they still had to get them, while 24% of women who had not been vaccinated did not know if women would still need to get them if they were vaccinated. These study results highlight that receiving the HPV vaccine does not lead to increases in sexual risk taking, and thus researchers in this area can feel confident that recommending the HPV vaccine is not detrimental to women's health. However, the research does reveal that all women require more education about the HPV vaccine and health protective behaviours that must continue after vaccination.

The STI status of HPV and the current study. As previously demonstrated, the HPV vaccine is likely perceived as more than just a regular vaccine. The sexually

transmitted nature of the HPV virus is likely to have an impact on vaccine acceptance and uptake. This study examined these factors. Specifically, this study investigated participants' perceptions of STIs (i.e., as shameful and stigmatizing), their level of comfort with sexuality (i.e., sexual permissiveness), and their comfort asking a doctor for the HPV vaccine.

While this study was among the first to examine how the STI status of HPV and distrust in the medical establishment influences HPV vaccinations, there are various other psychological, social, and practical factors that have been found to influence actual or intended vaccinations. In order to develop a clear understanding of the various factors that influence vaccinations, these additional factors were also organized and assessed in this study. The theoretical framework that was used to organize this study is described next.

Theoretical Framework

Research in the area of HPV vaccination decisions has often utilized variables drawn from various health behaviour change theories. Concepts from theories such as the Theory of Planned Behaviour (TPB), Social Cognitive Theory, and the Health Belief Model (HBM) have frequently been applied to research on HPV vaccination intentions or behaviours, although often the theoretical origins of the concepts are not discussed, and theoretical models are not tested. Buchanan (2008) has been one of the few researchers in this area to specifically set out to test models of HPV vaccination decisions. In her dissertation research, she found that an integrated model that incorporated three components of the Health Belief Model (susceptibility, benefits, and self-efficacy) and the subjective norms component of the Theory of Planned Behaviour was more predictive

of university women's intentions to obtain the HPV vaccine than either model alone. More specifically, she found that the HBM alone accounted for 43% of variance in intentions, the TPB accounted for 39% of variance, and the integrated model accounted for 51% of the variance in intentions. In her studies, she examined the direct relationships between the variables assessing each component of the models being tested, and the outcome vaccination intentions. In light of her research findings, and after an examination of both the HBM and the TPB, as well as past research in the area of HPV vaccination, it was decided that all components of the Health Belief Model would be measured in the current study, and that the concept of subjective norms from the Theory of Planned Behaviour would also be assessed. Based on Buchanan's findings, the remaining components of the TPB were not assessed. The history of these theories is briefly discussed next.

Background: Health behaviour theories. Health behaviour theories are ways to examine the factors that influence whether people will perform certain health behaviours (Conner & Norman, 1995). Ultimately, the practical application of using these theories is to gain an understanding of how health behaviours can be modified so that negative behaviours can be discouraged, and positive behaviours encouraged. Some of the most popular health behaviour theories are the Health Belief Model (HBM) (Becker, Haefner & Mainman 1977), the Theory of Planned Behaviour (TPB) (Ajzen, 1991), and the Transtheoretical Model of Behaviour Change (Prochaska & DiClemente, 1983), which is often called the "Stages of Change" model. Research into various types of health behaviours has been conducted using these theories, with some theories being more predictive of certain behaviours than others. The Health Belief Model, for instance, has

historically been good at predicting vaccine intentions or acceptance (e.g., for the influenza vaccine), but for other issues such as smoking cessation or weight loss, the Transtheoretical model has gained popularity.

The Health Belief Model. The Health Belief Model (Becker, Haefner & Mainman 1977) is one of the oldest health behaviour theories (Sheeran & Abraham, 1995). In the 1950s, health professionals recognized the need to develop a framework to identify modifiable psychological variables that influence health behaviour (Sheeran & Abraham, 1995). Kurt Lewin is credited as a primary influence on the group of individuals who began the early research and theory building that would lead to the Health Belief Model. Lewin's idea that an individual's behaviour is influenced by their perception of situations or environments was embraced by these early researchers and is reflected in the assumptions of the model (Rosenstock, 1974). Initial tenets of the model stated that in order to propel an individual to participate in health behaviours, a person needs to believe: (1) that they are susceptible to the disease or illness, (2) that the impact of the disease would be at least moderately severe, (3) that taking a prescribed action would be beneficial in that it would prevent the disease or that it would lessen its negative impact on the individual, and (4) that engaging in the health behaviour would not mean that an individual had to overcome strong psychological barriers (Rosenstock, 1974). Thus, the initial four core components of the HBM are: *perceived susceptibility*, *perceived severity*, *perceived benefits*, and *perceived barriers*. Additional research on the development of the HBM eventually lead to the addition of the components of *cues to action*, *self-efficacy*, and *knowledge*. A description of each of these components is presented later in this document.

The Theory of Planned Behaviour. The Theory of Planned Behaviour assumes that individuals undertake a rational decision-making approach when considering health behaviours (Edberg, 2007). It is assumed that people's behaviours are influenced by their (1) attitudes toward the behaviour, (2) what they believe other peoples' perceptions of the behaviour are (these perceptions are termed *subjective norms* in the TPB), and (3) their level of perceived control for engaging in the behaviour (Edberg, 2007).

Definitions of the Model Components Measured in This Study

HBM: Perceived susceptibility. Perceived Susceptibility is an individual's belief in how susceptible one is to a disease, health problem, or condition. Rosenstock (1974) described the various levels of perceived susceptibility that an individual may experience. They range from an individual not believing they are at risk at all, to those who admit there is a statistical probability of developing an illness but do not believe they are personally at risk, to individuals who believe they are definitely at risk. In a meta-analysis conducted by Janz and Becker (1984) perceived susceptibility was found to be a significant predictor in 77% of examined studies, making it the third most predictive component of the four core components of the HBM.

HBM: Perceived severity: Perceived severity is the component of the HBM that assesses individuals' perceptions of the severity of an illness, condition, or injury (Maiman & Becker, 1974). When discussing the physical severity of an illness or injury, effects can include things such as the impact of disease on the body, pain, health complications, etc. (Edberg, 2007; Sheeran & Abraham, 1995). In addition to these physical perceptions, perceived severity can also include perceptions of how severe an impact an illness or injury can have on the practical, day to day aspects of one's life (e.g.,

not being able to drive a car as a result of breaking a leg) (Edberg, 2007; Rosenstock, 1974), as well as the severity of possible psychosocial effects and impacts on social roles (e.g., feeling uncomfortable dating someone new as a result of having an STI) (Sheeran & Abraham, 1995). Janz and Becker (1984) found that perceived severity was the least predictive of the four core components, although it was still a significant predictor in 59% of the studies they examined.

HBM: Perceived benefits. Perceived benefits are the benefits an individual perceives will arise from engaging in a specific health promoting activity (Edberg, 2007; Sheeran & Abraham, 1995). For example, in the context of HPV vaccination, an individual might perceive that being vaccinated against HPV would result in the benefit of immunity to the virus. In the meta-analysis conducted by Janz and Becker (1984), perceived benefits were significant predictors in 81% of studies, making it the second most predictive component of the four core components. Rosenstock (1974), in a discussion of this component, proposed that individuals assess the benefits that multiple courses of action have for themselves in relation to certain aspects of their health. An individual's health related behaviour will then be influenced not only by their opinion of how beneficial one proposed course of action would be, but also in comparison to how beneficial other courses of action would be as well. For instance, if an individual was considering the HPV vaccine as a method to protect themselves from HPV infection, they may also consider the benefits of condom use or abstinence in relation to the benefits of the vaccine.

HBM: Perceived barriers. Perceived barriers are the obstacles an individual believes stand between themselves and a desired health related activity (Sheeran &

Abraham, 1995), or the negatives that may arise if any individual engages in certain health behaviours (Edberg, 2007). Barriers can include practical barriers (e.g., time, cost) as well as psychological barriers. These psychological barriers can include things such as feelings and emotions (e.g., embarrassment, fear of stigma if asking for the HPV vaccine), and psychologically related skills (e.g., lack of social skills, lack of self-efficacy) (Sheeran & Abraham, 1995). As Sheeran and Abraham point out, given this broad definition, there is an abundance of possible barriers that can influence whether individuals engage in health protective behaviours. In the study by Janz and Backer (2008), perceived barriers was found to be the most predictive component of the model. In 91% of the studies they examined, the barriers component of the HBM was a significant predictor.

HBM: Cues to action. According to Edberg (2007), cues to action are external events that motivate a person to act. Without these cues, health behaviour change might not occur. Cues can be represented by a large range of things, such as mass media campaigns, reading a story in a magazine, educational leaflets, conversations with friends, and urgings of medical professionals, to name a few (Sheeran & Abraham, 1995). In Maiman and Becker's (1974) chapter on the HBM and its origins and correlates in psychological theory, they discussed how cues to action make an individual aware of their feelings on a certain topic, and allow them to make decisions about how they want to act (e.g., should they engage in the behaviour or not?). To use cues to action effectively in research with the HBM, Sheeran and Abraham (1995) argue that cues to action should be operationalized by asking respondents if they received cues, and if so, how much the cue influenced their decision to engage in the target behaviour. They also

note that a crucial aspect of using Cues to Action in research is to ensure that the range of relevant cues is assessed.

HBM: Self-efficacy. Self-efficacy is a construct originally derived from Social Learning Theory (Bandura, 1977). It is a person's belief in his or her ability to take an action (Edberg, 2007; Leonard, Hotz, Hansen & Plotnikoff, 1999). When used in the Health Belief Model, it measures a person's self-efficacy in carrying out a health behaviour (in the current study, getting the HPV vaccine). Self-efficacy has been found to be predictive of health behaviours across many studies (Wallston, 2001).

HBM: Knowledge. The component of knowledge is rather self-explanatory; an individual's knowledge of a health issue is believed to have an impact on their desire to engage in specific health protective behaviours. For instance, if an individual is not aware of a particular health threat or protective behaviour, they cannot be expected to act on this information. Thus, the amount of knowledge that an individual has about HPV or the HPV vaccine may have an impact on their desire to receive the immunization.

TPB: Subjective norms. Broadly, subjective norms are "the customary codes of behaviour in a group or culture, together with the beliefs about what those codes mean" (Edberg, 2007, p. 39). The Theory of Planned Behaviour states that one of the determinants of an individual's intention to engage in a certain behaviour, is the subjective norms that surround that behaviour. These norms are the beliefs that a person has about significant others' opinion of them engaging in the behaviour (Conner & Sparks, 1995). Only the norms of individuals or groups (called "referents" in the TPB) whom the person believes are significant are assumed to influence behaviour. In the

current study, possible referents were parents, friends, and romantic partners, as well as doctors or other health professionals, and media sources.

Interestingly, the impact that peers and social groups have on behaviour was noted in early writings describing the HBM. For instance, Rosenstock (1974) states that beliefs "are undoubtedly influenced by the norms and pressures of…social groups" (p.4). Thus, by adding a social norms component to the planned adapted HBM, I am not only acting in accordance with previous research findings in the area of HPV vaccination, but the addition also falls in line with earlier conceptualizations of the HBM and related concepts. A study that utilized the Theory of Planned Behaviour to assess mothers' intentions to vaccinate their daughters for HPV also found that subjective norms were associated with vaccine intentions (Askelson et al., 2010). Thus, the current study also assessed participants' subjective norms.

The Model Tested In The Current Study

When working with the Health Belief Model, one quickly realizes that there are limitations to overcome when trying to develop a model to test the components described in this theory. As Sheeran and Abraham (1995) discuss, no formal definitions of the model components have been developed. Thus, definitions have been left open to the interpretation of individual researchers. In addition, no clear paths between variables have been established. For example, a formula was never developed to weigh perceived benefits against perceived barriers, although the constructs are at times described as mathematically related, with benefits needing to be subtracted from barriers (Sheeran & Abraham, 1995). The result of the flexible operationalization of the constructs of the HBM, and the lack of established hypotheses about how the components may impact one

another, has meant that researchers develop their own measurements and models based on their areas of research.

The goal of this study was to develop a comprehensive structural equation model of vaccination decisions, which included an investigation into the interrelationships between the model components. Because little model testing has been conducted in this area, a model of vaccination decisions had to be developed from the ground up. Hypotheses about the possible paths between components, and how the components and variables may impact each other were developed after carefully considering the research in this area. The initial model of HPV vaccine intentions that was developed and tested for this study can be seen in Figure 1. Knowledge and Cues to Action are the first variables to be considered in the model. It is proposed that the level of Knowledge an individual has about HPV, and the Cues that they receive from others to obtain it, are the primary variables that influence how the decision making process begins. Level of Knowledge and Cues are then hypothesized to impact individuals' perceptions of the Severity of HPV, perceptions of Susceptibility to the virus, and views of the Subjective Norms surrounding vaccination. Once these constructs have been processed by the individuals, Benefits and Barriers associated with vaccinations are considered. Barriers are also then influenced by perceptions of self-efficacy, as high or low levels of efficacy may influence how able or unable an individual feels they are to overcoming barriers. Finally, after an assessment of the Barriers and Benefits individuals believe surround vaccination, vaccination intentions are formed.

Figure 1

Proposed Model of HPV Vaccination Intentions
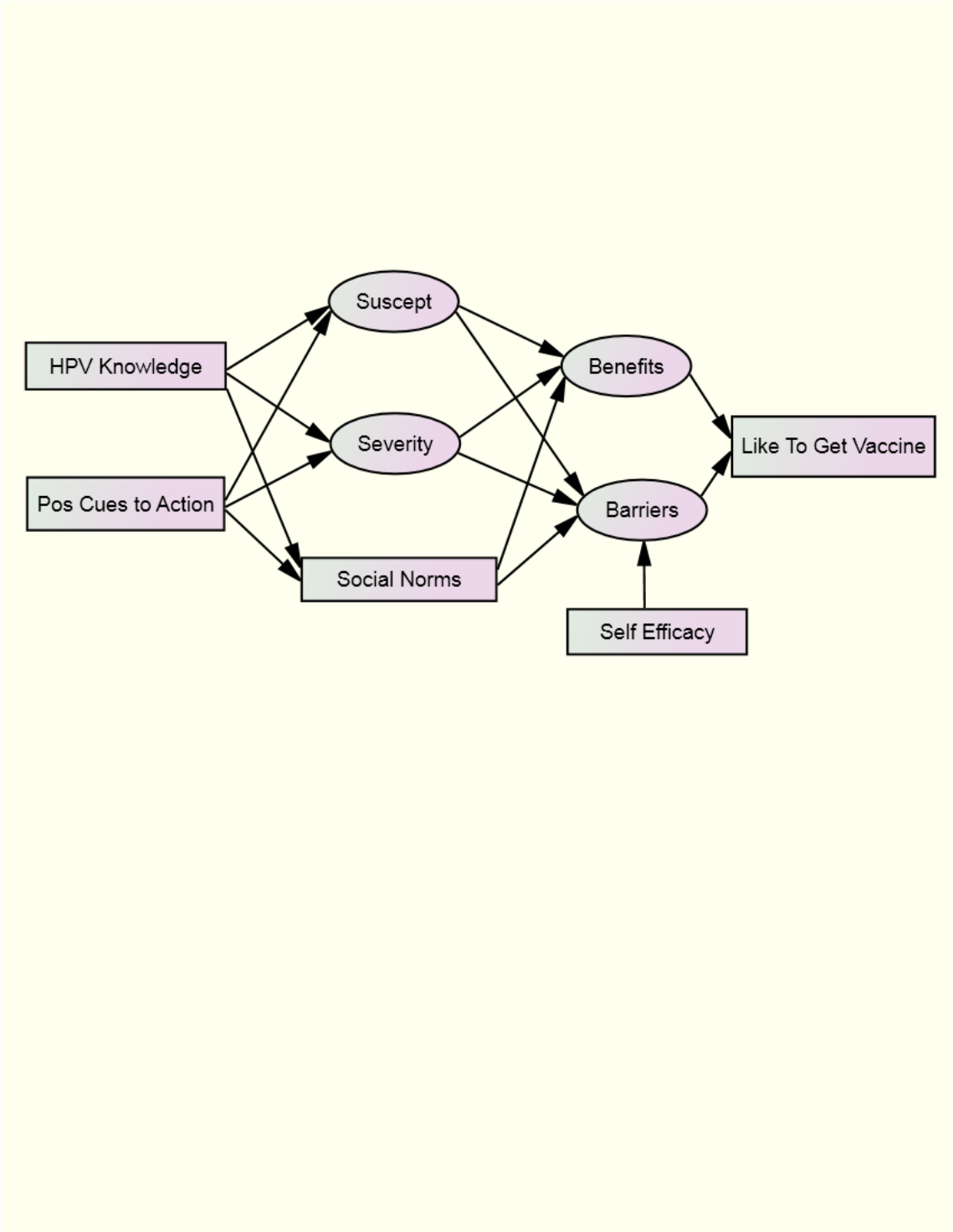
Past HPV and HPV Vaccine Research Related to the Model Components Being Tested

There have been multiple studies investigating factors that are associated with anticipated or actual HPV vaccine acceptance. While the current study sought to understand how some novel variables influence vaccination decisions, in order to develop a comprehensive understanding of HPV vaccine decisions, various other factors that past research had found to be predictive of immunizations were also investigated. Because this study used a modified Health Belief Model as its theoretical framework, the results of previous studies are organized and described below as they relate to applicable HBM and TPB categories.

Susceptibility. The degree to which a woman or girl feels susceptible to HPV infection has been found to influence vaccine acceptance. While a few studies have specifically asked participants if they felt susceptible or at risk of acquiring HPV, more studies have investigated factors that can presumably be thought to influence perceptions of susceptibility (e.g., whether one is sexually active or not, whether one has ever had an abnormal Pap test, whether one is married, etc.). One study that investigated perceived susceptibility specifically was done by Kuitto, Pickel, Neumann, Jahn and Metelmann (2010). They conducted a questionnaire study of 760 German women to investigate factors associated with actual HPV vaccine receipt and found that high perceived risk of HPV infection was indeed predictive of vaccination.

Current sexual activity and relationship status have been found to influence HPV vaccination intentions or behaviours. For example, Marshall, Ryan, Roberton, and Baghurst (2007) found that married individuals were unlikely to want the HPV vaccine in

comparison to those who were unmarried. In addition, as individuals aged, they were less

likely to want to be vaccinated (one may assume because they felt less susceptible to

infection). In the same study, it was also found that those who were in a monogamous

relationship and those who were not currently sexually active reported that they would be

concerned about getting a vaccine that did not relate to their current life situation (i.e.,

they did not believe themselves to be at risk of infection). Caskey, Lindau and Alexander

(2009) found similar results in their study of 1011 females aged 13-26 years. When they

assessed barriers to HPV vaccine adoption, 13% of 13-17 year olds, and 23% of 18-26

years olds reported "other" reasons for not wanting the vaccine. These included being

married or already having HPV (and thus believing one is not susceptible). When sexual

activity was examined as a barrier, 47% of 13-17 years olds noted that not being sexually

active was an obstacle to receiving the vaccine, while 19% of 18-26 years olds reported

the same. Interestingly, the same study also found that 78-80% of participants reported

that they would want the vaccine if they had an abnormal Pap test in the past, indicating

again, that factors related to susceptibility influence desires to be vaccinated.

Having multiple sex partners or ever having had an STI has been found to be

predictive of vaccine acceptance in some studies. Jones and Cook (2008) conducted a

study examining intent to receive the HPV vaccine among 340 college students. Ever

having had an STI, or having a close friend or relative who had HPV was related to

greater intent to receive the HPV vaccine. Compared to individuals who had never had

sex, those who have had sex were more likely to intend to receive the vaccine. When

number of sexual partners was examined, individuals with more than 5 sexual partners

were more likely to want the HPV vaccine than were people with 1 to 5 partners.

The influence of having an abnormal Pap test, and thus feeling more at-risk, and its possible link to HPV vaccine acceptance were also found in other studies (Eaton et al., 2008; Ferris, Waller, Owen & Smith, 2008; Short et al., 2010). A study of mid-adult women who had experienced an abnormal Pap test found that these women were more likely to report that they would want the HPV vaccine after receiving an educational intervention, than women who had not had a history of abnormal tests (Ferris, Waller, Owen & Smith, 2008). The authors of the same study also found that knowledge of the link between HPV and cervical cancer, as well as beliefs about their own risk of acquiring HPV, positively influenced women's desires to be vaccinated. In a study that examined perceived prevalence and risk of acquiring HPV in women who have sex with women (N = 275), participants were also more likely to perceive that they were at risk for HPV infection if they had ever had an abnormal Pap test (Eaton et al., 2008). Twenty-seven percent of this population reported having had abnormal Pap tests in the past, and 5% had been officially diagnosed with HPV.

In light of this past research, the current study investigated participants' perceptions of susceptibility in various ways. General questions inquired specifically about participants' perceived susceptibility (e.g., do you feel susceptibility to HPV infection?) and were used to create a scale measuring perceptions of susceptibility. In addition, other questions about specific sexual, relationship, and gynecological behaviours or experiences were also asked as these variables were proposed to influence vaccination decisions.

Knowledge. A large amount of research investigating HPV knowledge was conducted around the time of the HPV vaccine release. These early studies revealed that,

in general, HPV knowledge was low to moderate (Brewer & Fazekas, 2007; Zimet, 2005). Lenehan et al. (2008) found that Canadian women had a moderate level of HPV knowledge, although women knew little about the HPV vaccine. Research has also been conducted to examine the influence that HPV knowledge has on intentions or actual vaccination rates. The results of these studies have been mixed (see the review of HPV vaccine predictors conducted by Brewer & Fazekas, 2007, for more information).

Some studies have found that higher levels of HPV knowledge are associated with increased vaccination intentions or behaviours (Gerend, Weibley & Bland, 2009; Woodhall et al., 2007). An interesting study that investigated the effectiveness of a knowledge intervention on HPV vaccine acceptance, found that when comparing individuals who had received an online knowledge intervention with individuals who did not, that those who viewed the site felt increasingly susceptible to HPV infection, had more knowledge about HPV and its risk factors, and had improved attitudes toward the vaccine (Doherty & Low, 2008). Interestingly, while both men and women had more positive attitudes toward vaccination after viewing the site, women's scores were significantly higher than men's. It is important to note, however, that before viewing the website intervention the researchers found that women knew more about HPV and its risk factors than men, and that women felt more at risk for acquiring the virus. Another intervention study found similar results where after receiving an intervention intended to raise HPV related knowledge, participants' acceptance of the HPV vaccine for their daughters increased (Chan, Cheung, Lo & Chung, 2007).

In contrast to the research described above, some studies have not found a relationship between HPV knowledge and vaccinations. For example, a study that

compared two groups of participants, one who was given information about HPV and a control group who was not, found that although knowledge differed between the two groups at the end of the study, HPV vaccine acceptance was not significantly different (Dempsey, Zimet, Davis & Koutsky, 2006). Buchanan (2008) also did not find that knowledge predicted HPV vaccine intention in her college sample, although the internal reliability of her measure was low, and might have accounted for the nonsignificant results.

While the impact of knowledge on HPV vaccination appears to vary, the influence of knowledge on other health behaviours seems likely. After all, knowing that a Pap test is necessary and what it is for is likely to influence whether women get the test. It may be that if knowledge does not have direct links to HPV vaccine acceptance, it has indirect links. These indirect relationships may arise through the influence of knowledge on factors such as perceptions of susceptibility, severity and social norms. This study investigated whether knowledge has a direct impact on vaccination decisions, as well as whether it had an impact indirectly, through variables such as perceived severity and susceptibility. This was done through structural equation modeling.

Severity. How severe an individual believes HPV infection to be is theorized to influence their HPV vaccination behaviours. While individuals generally perceive HPV infection or its outcomes to be severe (Cates, Brewer, Fazekas, Mitchell & Smith, 2009), the predictive ability of this construct as it relates to HPV vaccination is still debateable (Brewer & Fazekas, 2007). Some studies have found a relationship between severity and HPV vaccine behaviours. Zimet et al. (2005) found that parents who would accept the HPV vaccine for their daughters were more likely to perceive an STI diagnosis as

physically and emotionally severe. Other studies have not found such a relationship, however. In her dissertation, Buchanan (2008) did not find that perceived severity was predictive of HPV vaccine intentions, and neither did Jones and Cook (2008), who did not find a relationship between perceived severity of HPV and intent to get the vaccine in their study of male and female college students. Dempsey, Zimet, Davis and Koutsky (2006), also did not find that severity was predictive of vaccine intentions.

In addition to investigating how severity is related to HPV vaccinations, research has also reported on individuals' perceptions of the severity of HPV or its outcomes. A study that investigated racial differences in HPV knowledge and vaccine acceptability, found that 71% of black women and 91% of white women believed that HPV would be a serious threat to health (Cates, Brewer, Fazekas, Mitchell & Smith, 2009). Because of its link to cancer, it is also important to understand if women associate HPV with cancer, and whether they believe that this risk is severe. This study did this by investigating fear of cervical cancer. Studies have shown that a fear of developing cancer is a common reaction after a woman has an abnormal Pap test or is told she has HPV (Gath et al., 1995; Juraskova et al., 2007; Karasz, McKee & Roybal, 2003; Maissi, Marteau, Hankins, Moss, Legood & Gray, 2004). A Canadian study by Sauvageau, Duval, Cilca, Lavoie and Ouakki (2007) found that 57% of their adult, female participants feared developing cervical cancer, and that this anxiety about cervical cancer was consistent across all age groups. The same study found that 93% of participants believed that cervical cancer is serious. Similar findings were also found by Kahn, Rosenthal, Hamann and Bernstein (2003), with 94% of their female sample reporting that they believed that cervical cancer would be a moderate to severe health problem. Interestingly, a German study found that a

fear of cancer predicted HPV immunizations (Kuitto, Pickel, Neumann, Jahn & Metelmann, 2010).

While the research described above appears to indicate that perceived severity does not influence HPV vaccine behaviour, a systematic review of HPV vaccination predictors found mixed results about the impact that perceived severity has on vaccine acceptance (Brewer and Kazekas, 2007). In light of this debate, and with the understanding that individuals do believe that HPV is severe, the current study investigated whether a relationship between these variables does exist. Indirect relationships between the variables were also assessed during the testing of the proposed model of HPV vaccination decisions.

Barriers. As discussed in the theory section of this document, the barriers that can impede a person from engaging in a health behaviour can be both practical/physical as well as psychological. Earlier in this paper some potential psychological barriers were discussed, such as vaccine safety fears, medical distrust, and factors related to the STI status of HPV. This study investigated whether these were indeed barriers to HPV vaccination. Other barriers were also investigated. For instance, past research has consistently found that cost is a major barrier to HPV vaccination, as is access to a health care professional, and time. Types of barriers investigated by past research are discussed now.

The cost of the HPV vaccine has been one of the most researched potential barriers, and studies have found that cost does influences intentions to vaccinate. In their study examining barriers to HPV vaccine adoption, Caskey, Lindau and Alexander (2009) reported that 27% of women between 18 and 26 reported that the cost of the vaccine is

too high. Kahn et al. (2008) also found that cost was a concern, where only 42% of girls

and women aged 13 to 26 from their study felt that they could afford to get vaccinated.

Not surprisingly then, a Canadian study found that 91% of male and female adults living

in Quebec would agree to the HPV vaccine if it was funded; however, this rate dropped to

72% if individuals had to pay $100 per dose (Sauvageau, Duval, Cilca, Lavoie & Ouakki,

2007). More worrisome, the proportion of individuals aged 18 to 25 (one of the most

important target groups for the vaccine) changed their perceptions of the vaccine once

cost was added as a factor, with the rate of people who would strongly agree that they

would get the vaccine falling from 56% to 28% if individuals had to pay. This change

was not as drastic for individuals aged 26 to 30. One can presume this is due to the

increased financial resources of this group. Rosenthal et al. (2008) found that 9% of their

parent sample thought that the HPV vaccine was too expensive, 47% were unsure, with

only 44% believing that the cost would not be prohibitive. In addition, the study by Kahn,

Rosenthal, Hamann and Bernstein (2003) also found that some participants reported cost

as a concern when contemplating HPV vaccination.

Cost is not the only practical barrier to vaccination, however. A fear of needles or

the pain of the injection has also been cited as a barrier in some studies (Burke, Vail-

Smith, White, Baker & Mitchell, 2010; Kahn et al., 2003). Gottvall, Larsson, Hoglund

and Tyden (2009) found that 19% of their Swedish student sample reported that a fear of

needles would be a barrier. A qualitative research study by Short et al. (2010) found that

the vast majority of their adult sample (aged 27-55) believed that there were barriers to

HPV vaccine uptake and these included cost, a fear of side effects, and hassles. Burke,

Vail-Smith, White, Baker and Mitchell (2010), also found that a fear of side effects would

act as a barrier. This was reported as a concern by 42.9% of their sample. Caskey, Lindau and Alexander (2009) found that not having a regular healthcare provider is a barrier to adoption as well, while the hassle of having to go to a doctor to get the vaccine was cited as a barrier in another study (Burke et al., 2010).

As the above research demonstrates, a variety of psychological and practical considerations can impact HPV vaccine intentions and actual uptake. The current study investigated some of these practical and psychological barriers. These included fear of stigma if asking a doctor for the vaccine, physician trust, pharmaceutical company trust, STI stigma and shame, sexual permissiveness, and cost.

Benefits. In order for a person to be motivated to engage in a health promoting behaviour, the HBM would propose that they recognize that the behaviour will be beneficial. In her examination of the utility of the HBM for predicting HPV vaccination intentions, Buchanan (2008) found that perceived benefits were predictive of intentions. In Canada, Ogilvie et al. (2007) found that perceptions of the vaccine was the strongest predictor of mother's intentions to vaccinate their daughters against HPV. Items that assessed these perceptions included items that inquired about HPV vaccine safety, effectiveness, whether vaccine are beneficial in general, and whether the HPV vaccine is beneficial for boys and girls, specifically.

Researchers have investigated whether participants believe that the HPV vaccine will be/is effective. For instance, Rosenthal et al. (2008) found that 75% of their study's parent sample believed that the HPV vaccine would protect their children from cervical cancer and genital warts, indicating that beliefs in the benefit of the vaccine vary (25% of the sample did not believe it would be protective). Basu, Chapman and Galvani (2008)

conducted a study that revealed that participants believed that being vaccinated against

HPV would significantly lower their risk of cervical cancer and genital warts. Of course,

belief in the effectiveness of the vaccine is a perceived benefit. If an individual believes

the vaccine will work to protect them from infection, then they will likely believe that the

vaccine is beneficial. Caskey, Lindau, and Alexander (2009) investigated the concept of

perceived effectiveness and vaccine uptake. They found that 16% of their female

participants, aged 13-26, reported that they were unsure if the HPV vaccine would work.

In their study, however, beliefs about the effectiveness of the vaccine were not predictive

of HPV vaccinations.

Dempsey, Zimet, Davis and Koutsky (2006) also investigated perceived benefits

of HPV vaccination. They found that parental beliefs about the benefit of the vaccine for

children or for society were significantly associated with vaccine acceptance. Relatedly,

an Icelandic study of willingness to participate in an HPV vaccine trial found that the

main reason individuals would want to participate in a trial was for their own or

community benefits (Gudmundsdottir et al, 2003). These studies revealed that not only

are individual benefits a motivating factor to encourage vaccinations, but that beliefs in

the benefit of vaccinations for society at large may also be predictive of vaccination

decisions (in the current study these beliefs are referred to as vaccine positive beliefs).

In light of the research summarized above, this study investigated the impact that

perceived benefits of HPV vaccination had on vaccination decisions. The variables that

assessed the construct of benefits in this study measured beliefs in the effectiveness of the

HPV vaccine, as well as beliefs that vaccines are beneficial for the self or society (vaccine

positive beliefs).

Self-efficacy. Deciding to obtain a vaccine or to engage in any health promoting activity will be influenced by how much self-efficacy a person has for engaging in the behaviour. While self-efficacy beliefs for a variety of behaviours may be complex and require concerted effort to develop (for example self-efficacy to quit smoking or to begin a physical activity regime), the type of self-efficacy required to obtain a vaccine is likely to be more focused on feeling efficacy to overcome barriers to adoption, for instance, feeling efficacy in one's ability to get to a doctor for three shots, or for saving the money needed to purchase the shots. A link between self-efficacy and intentions to get the HPV vaccine has been found in at least two studies (Buchanan, 2008; Kahn et al., 2008). Kahn et al. (2008) found that intentions to get vaccinated were related to individuals' beliefs in their ability to get the vaccine, although the authors mention that this relationship was not as strong as they had originally anticipated. Buchanan was also one of the first to examine this construct and found it to be predictive of intentions as well. Due to its inclusion in new versions of the HBM, and due to the promising results that other studies have found when investigating this variable, this current study investigated how self-efficacy influences HPV vaccination. After all, while individuals may recognize that there are barriers to obtaining the HPV vaccine, they may have varying levels of self-efficacy for overcoming such barriers.

Cues to action. Cues to action are the external events that occur that motivate a person to act in a certain way. In terms of cues for HPV vaccination, these may be cues from friends, family or media, although the most researched types of cue are those that come from physicians or other health professionals. As discussed elsewhere in this document, Caskey, Lindau and Alexander (2009) investigated factors that influence HPV

vaccination in girls and women. They found that for both age groups investigated (those 13-17 and those 18-26) speaking with a healthcare provider was associated with vaccination. For those aged 18-26, speaking with a family member was also predictive. In their large study of parental attitudes toward the HPV vaccine, Dempsey, Zimet, Davis and Koutsky (2006) found that physician recommendations were related to vaccine acceptance. In a Canadian study, Lenehan et al. (2008) found that physician recommendations would influence women's willingness to obtain the vaccine. As these results indicate, doctors who discuss the vaccine with their patients are likely to influence uptake, indicating that cues to action are likely associated with HPV vaccinations. While the majority of HPV vaccine research has investigated physicians' cues to action, the current study will also investigate cues from other sources as well.

Subjective norms. The final type of research that will be reviewed in this section on past predictors of HPV vaccinations are studies that have investigated the impact of subjective norms on HPV vaccination rates or intentions. Buchanan (2008) found that the subjective norms component of the Theory of Planned Behaviour was the only component from this model that was predictive of intentions to receive the vaccine in her study comparing the HBM and the TPB. Limited other studies have also investigated norms. Kahn et al. (2003) investigated 52 young women's attitudes toward the HPV vaccine, as well as their intentions to receive it. They found that various factors were associated with intentions, one of which were women's beliefs that others would approve of the vaccine. These significant others included parents and romantic partners. Dempsey et al. (2006) also investigated parental attitudes toward the HPV vaccine. Along with other factors, including cues to action as noted above, they found that peers influenced

decisions to obtain the vaccine. Finally, a Canadian study found that subjective norms were predictive of mother's intentions to vaccinate their daughters, with physician's recommendations being particularly influential (Ogilvie et al., 2007). In light of this research, the current study examined participants' beliefs about the subjective norms of others.

The Current Study

This study was a theoretically guided investigation into factors that are related to actual or intended HPV vaccinations in a sample of women who reside in Canada aged 18 to 30. A modified version of the Health Belief Model was used as the theoretical framework for this study. All components of the HBM were utilized in the study model, with the addition of the construct of *subjective norms* from the Theory of Planned Behaviour. Direct relationships between the variables used to assesses the theory components and the study outcomes were investigated. In addition, a proposed model of HPV vaccination intentions was designed and tested.

While past studies have examined the impact of multiple variables on HPV vaccinations, the current study investigated the impact of a number of novel variables. The new variables that were assessed in this study were: distrust in physicians and pharmaceutical companies, sexual attitudes, STI stigma and shame, and comfort asking a physician for the vaccine due to fear of stigma. All of these variables were assessed under the *barriers* component of the HBM. In addition to these novel variables, past research has investigated various other factors and their relationship to HPV vaccination decisions. These variables were organized using the theoretical framework from this study, and their relationship with the study outcomes was also assessed. A brief discussion of the study

variables that were assessed in this study follows. A summary of this description can also

be found in Table 1. For organizational purposes, each component of the model is listed

here along with the variables that will be used to assess it (1) To investigate the impact of

perceived susceptibility on HPV vaccination intentions or actual uptake, questions

inquiring about perceptions of susceptibility were asked and compiled into a scale. In

addition, questions inquiring about relationship history and sexual history were asked.

These questions may influence an individual's perception of their susceptibility. Sexual

history questions included past and current condom use, number of sexual partners,

sexual experiences (e.g., ever having intercourse) and ever having been diagnosed with an

STI. (2) To investigate the *perceived severity* of HPV infection, questions assessing the

perceived severity of the virus on the body were asked, as were questions on the

perceived severity of treatment, fears of cervical cancer, and the social impact of

infection. (3) *Perceived benefits* of vaccination were assessed by asking participants

whether they believed that getting the HPV vaccine would be beneficial (i.e., it would

prevent HPV infection), and whether they valued vaccinations (vaccine positive beliefs).

(4) Two types of *perceived barriers* were investigated in this study: psychological

barriers and practical barriers. The psychological barriers included physician and

pharmaceutical company distrust, perceptions of STIs and related stigma and shame, fear

of stigma if asking a doctor for the vaccine, attitudes toward sex, and vaccine safety fears.

Practical barriers that were assessed included things such as cost and access to a doctor

one feels comfortable speaking with. (5) *Knowledge* of HPV was investigated through an

HPV knowledge questionnaire. Knowledge of the HPV vaccine was also assessed with

its own questionnaire. (6) Various *cues to action* were investigated by asking participants

Table 1

Variables Used In the Current Study

Variable/Scale	Health Belief Model							TPB
	Perceived Susceptibility	Perceived Severity	Perceived Benefits	Perceived Barriers	Know-ledge	Cues to Action	Self Efficacy	Subjective Norms
Susceptibility scale questions	X							
Relationship status info.	X							
Sexual experience info.	X							
Gynaecological health history	X							
Severity of virus on body		X						
Severity of treatment		X						
Fears of cervical cancer		X						
Severity of social impact		X						
Vaccine efficacy			X					
Vaccine positive beliefs			X					
Pharmaceutical company trust				X				
Physician trust				X				
STI stigma and shame scale				X				
Fear doctor stigma				X				
Access to trusted medical care				X				
Sexual attitudes (SAS)				X				
General vaccine safety fears				X				
HPV vaccine safety fears				X				
Cost				X				
HPV knowledge questions					X			
HPV vaccine knowledge questions					X			
Cues to action questions						X		
Obtaining vaccine self-efficacy							X	
Subjective norms								X

if they have heard about the HPV vaccine from various sources (e.g., friends, the media, romantic partners, parents). (7) Feelings of *self-efficacy* were investigated by asking various questions about participants' level of belief that they could obtain the vaccine in order to create a scale score. Finally, (8) The influence of *subjective norms* on vaccination intentions or actual uptake was also assessed. Participants' beliefs of the opinions of significant others on the topic of HPV vaccination were assessed (e.g., would this person or group support you getting the vaccine?).

While many predictor variables have been described, it is also important to understand how outcome variables were assessed in the current study. Actual vaccination status was one of these outcomes. Whether female participants had received the HPV vaccine or not was assessed, and participants were classified as either vaccinated or not vaccinated. Thus, having obtained the HPV vaccine or not was one dichotomous outcome variable used in this study. Individuals who had obtained the vaccine did not complete any additional outcome items. The remaining outcome items assessed the intentions of those who had not yet been vaccinated. Participants who had **not** received the vaccine were asked about their intentions to receive it. More specifically, these individuals were asked two questions (1) if they would like to get the vaccine, and (2) whether they think they will actually get it, regardless of whether they want it or not. It was hypothesized that the two outcome items, while similar, would assess two distinct aspects of vaccination intentions. The first, desire to get vaccinated, assessed whether individuals want the vaccine. The second item, thoughts about whether one would actually get it, assessed the more complex idea that although individuals have a certain level of desire for the vaccine, this level of desire may not correspond to whether an individual actually thinks they

would ultimately engage in the behaviour. Much like a cigarette smoker may desire to quit smoking, they may or may not think that they actually would quit. Social psychology has shown that attitudes are often not predictive of behaviours (Myers & Spencer, 2001). However, attitudes are more predictive when the measured attitude is specific to the situation under investigation (Myers & Spencer, 2001). Thus, the current research aimed to investigate both desires, and actual thoughts that one would engage in the behaviour.

In summary than, the current study had three main outcome variables that were assessed: The relationship between the model variables and (1) whether individuals obtained the vaccine or not (yes or no), (2) non-vaccinated women's desire to get the vaccine (one item rated on a 5 point scale), and (3) whether non-vaccinated women thought they would actually get it (one item rated on a 5 point scale). Thus, the current study investigated both actual uptake behaviours, as well as intentions. While all three outcomes were used when testing the direct effects of the predictor variables on outcomes, only HPV vaccine desires were used as the outcome when testing the proposed model of HPV vaccination intentions.

Hypotheses

The overall research question this study attempted to answer was: "What factors influence actual or anticipated HPV vaccinations in a sample of Canadian women aged 18-30?" The following set of hypotheses was developed to investigate the direct relationships between the predictor variables used in this study, and the outcome variables. All hypotheses, except for one, predicted positive relationships between the components and the outcomes (e.g., higher perceived severity, more positive subjective norms, or more cues to action would lead to more vaccinations or higher intentions to

vaccinate). One hypothesis, which described perceived barriers, anticipated a negative

relationship, so that as perceived barriers increase, actual vaccinations or intentions to

vaccinate decrease. The study hypotheses were:

    1. Perceived susceptibility to HPV infection will predict HPV vaccination, with

    higher levels of susceptibility being positively associated with actual or intended

    vaccinations.

    2. Perceived severity of HPV infection will predict HPV vaccination, with higher

    levels of perceived severity being positively associated with actual or intended

    vaccinations.

    3. Perceived benefits of receiving the vaccine will predict HPV vaccination, with

    higher levels of benefits being positively associated with actual or intended

    vaccinations.

    4. Perceived barriers to receiving the vaccine will predict HPV vaccination, with

    higher levels of perceived barriers being negatively associated with actual or

    intended vaccinations.

    5. Knowledge of HPV will predict HPV vaccination, with higher levels of

    knowledge being positively associated with actual or intended vaccinations.

    6. Self-efficacy for receiving the HPV vaccine will predict HPV vaccination, with

    higher levels of efficacy being positively associated with actual or intended

    vaccinations.

    7. Cues to Action will predict HPV vaccination, with more cues being positively

    associated with actual or intended vaccinations.

8. Subjective norms will predict HPV vaccination, with positive norm beliefs

being positively associated with actual or intended vaccinations.

In addition to these hypotheses, it was also predicted that the proposed model of

HPV vaccination intentions developed for this study would be a valid model, in terms of

showing good fit with the study data. Please see Figure 1 to review the model that will be

tested. It was anticipated that knowledge and cues to action would influence perceived

severity, perceived susceptibility, and subjective norms, which in turn would influence

perceived barriers and benefits. Barriers were also anticipated to be impacted by self-

efficacy. And finally, barriers and benefits were expected to impact vaccination decisions.

Chapter II

Method

Participants

Participants were 374 women, aged 18 to 30, residing in Canada. Participant ages ranged from 18 to 30 with an average age of 22.05 years ($SD = 3.54$). It should be noted that due to their ages, all individuals who participated in this study were most likely not involved in the grade eight school-based vaccination programs that began in 2006 or 2007. Thirty-six people who participated in this study were 18 years old at the time of data collection, and thus may have been in grade 8 the first year the vaccine was offered in schools. However, when asked why they obtained the vaccine, no participants reported that it was offered to them at school for free. Three people did report that they were able to obtain the vaccine at their school because they had medical insurance, but the type of school and the age when the vaccine was offered were not reported. The majority of participants, 90.4%, came from the province of Ontario, although women from five other provinces also took part in this study. These provinces were Alberta, British Columbia, Manitoba, New Brunswick, and Nova Scotia. The number of individuals from each of these other provinces ranged from two to 16. The majority of participants, 95.4%, had completed at least some university or college. When ethnic background was inquired about, the majority of participants, 79.7% of the sample, reported that they were White/Caucasian, 6.1% reported they were Middle Eastern/West Asian, 3.5% reported they were Chinese/Japanese/South-East Asian, 3.2% reported they were Black/African Canadian or American, 2.7% reported they were South Asian, 1.6% reported they were Aboriginal, 0.8% reported they were Latin American/Mexican, 1.9% reported they were

biracial, and 2.1% indicated they had an "other" background. Individuals could check more than one option, and thus, percentages exceed 100.

Measures

Measures presented to vaccinated and unvaccinated participants were mostly identical with the exception of some outcome measures. Where differences existed, they have been noted below. Many of the measures described were adapted from previous studies conducted by other researchers, or were created entirely by this author. Below, credit is given to scale items created and used in previous research. If a source is not mentioned, items were created by this author. Please see the Appendix to view questionnaires developed for this study. Questionnaires developed by other researchers are not included in this appendix. Before beginning this dissertation work, this author conducted a study investigating male HPV vaccination intentions that utilized earlier versions of some of the scales described below. While some of these adapted/created scales were changed significantly before the current study was conducted (e.g., scales assessing severity and susceptibility variables), some scales remained relatively unchanged. These scales and their Cronbach's alpha values are reported below where applicable.

Demographic Variables

Demographic questions inquired about participant age, education level, ethnicity, sexual orientation, household income, and province of residence.

Knowledge Variables

HPV knowledge. An HPV knowledge questionnaire, based largely on one developed by Daley et al. (2008), was used to assess HPV knowledge. Daley's scale

contains 22 items and was found to have a Cronbach's alpha of .81. Because recent research and media stories have discussed the link between HPV and head and neck cancers, two additional questions related to oral transmission were added to the scale for this study. The Cronbach's alpha for this scale in this study was found to be .84. In order to determine if the items added to this scale improved the Cronbach's alpha value, the score for the original 22 items was calculated, and was found to be .81, indicating the addition of the two items for this study improved the scale. Participants could respond to each question by indicating true, false or unsure. Scores were computed by summing the number of correct responses to each question.

HPV vaccine knowledge. To assess HPV vaccine knowledge, a seven item scale was used. Six of the scale items were used by Caskey et al. (2009) in a study where the questionnaire was administered to over 1000 female participants. Unfortunately, internal reliability statistics for these six items were not reported, although the results of their study did find that HPV vaccine knowledge varied. In addition to these six items, an additional question was added by the present author to inquire about participants' knowledge that the vaccine protects against genital warts. This was done to ensure that the scale items inquired about both cervical cancer and genital wart protection. The original six items made no mention of genital warts. Similar to General HPV knowledge, response options were true, false or unsure, and scale scores were computed by summing the number of correct responses. The Cronbach's alpha for the seven item scale was found to be .66. The alpha for the scale with just the original 6 items was .65, indicating that the addition of the seventh item did not decrease the Cronbach's alpha value.

Perceived Susceptibility Variables

Sexual history questions. The study questionnaire contained 8 questions inquiring about participants' past sexual experiences. These questions investigated: sexual orientation, if a participant ever engaged in sexual activity, how many sexual partners one has had, sex of most recent sexual partner, how many individuals a participant has had vaginal and anal intercourse with, age at first vaginal and anal intercourse, and how often condoms were used with male sexual partners currently and in the past.

Relationship status. Three items assessed participants' romantic relationship status. The items inquired about current relationship status, relationship status over the past two years (assessed with a five-point scale), and current relationship length.

Gynaecological health history. Information on participants' gynaecological history was gathered with five items which asked about Pap test history (if a test had ever been done, if it was abnormal, and if abnormal, the medical follow-up that was done), and STI and HPV infection experience.

Perceived susceptibility. To assess participants' feelings of susceptibility to HPV infection, four likert-scale questions were developed for this study. Questions asked participants if they felt at risk of experiencing: HPV, cervical cancer, genital warts, and having an abnormal Pap test. Response options ranged from 1 (very unlikely) to 5 (very likely). The Cronbach's alpha for the scale was found to be .88.

Perceived Severity Variables

Perceived severity of HPV infection. Perceived Severity of HPV Infection was measured with five items that assessed participants' emotional upset if they were to become infected with HPV, or if they were to develop a symptom such as genital warts,

or abnormal cervical cells. Upset at HPVs potential impact on the body and future fertility was also assessed. Responses were recorded on a scale ranging from 1 (not at all) to 5 (very much). Then Cronbach's alpha for this scale was .73.

Perceived severity of HPV treatment. Participants' upset at the impact or pain of treatment associated with HPV related illnesses such as genital warts or abnormal cervical cells, was assessed with five likert-scale questions. Response options ranged from 1 (not at all) to 5 (very much). The Cronbach's alpha for this scale was .80.

Perceived severity of the social impact of HPV infection. Similar to the previous two severity scales, perceived severity of the social impact of having HPV was assessed with six likert-scale items. Questions inquired about participants' upset if various significant others (doctors, friends, romantic partners) found out the participant had HPV, as well as the level of upset the participant would feel/did feel if they had to tell future romantic or sexual partners that they were infected. Again, response options ranged from 1 (not at all) to 5 (very much). The Cronbach's alpha for this scale was .88.

Fear of cervical cancer. Past research has consistently found that women who are told they have HPV or abnormal Pap tests, fear cancer. Because of this, the current study investigated whether women's fears of cervical cancer had an impact on vaccination decisions. Fear of cervical cancer was assessed by adapting the items of the Fear of Breast Cancer scale (Champion et al., 2004), to instead reflect fear of cervical cancer. The items developed by Champion et al. were used, except where the word breast appeared, it was replaced with the word cervical. Thus, the item that originally read "When I think about breast cancer, I get nervous", was changed to read "When I think about cervical cancer, I get nervous". Items were rated on a 5-point Likert scale ranging from 1 (strongly

disagree) to 5 (strongly agree). The Cronbach's alpha was .91 for the original Fear of

Breast Cancer Scale, and the construct validity of the original scale was supported by its

ability to predict mammography, as well as by relationships between the scale scores and

perceptions of threat and self-efficacy. The Cronbach's alpha for the fear of cervical

cancer scale used in the present study was .94.

Perceived Benefit Variables

      HPV vaccine effectiveness. Participants' perception of the effectiveness of the

HPV vaccine was measured with eight likert-scale questions. Questions inquired about

participants' beliefs about the protective benefits of the vaccine as they relate to HPV

infection, genital wart infection, abnormal cervical cells, future fertility, cancer, and

romantic and sexual relationships. Responses options ranged from 1 (not at all) to 5 (very

much). The Cronbach's alpha for this scale was .94.

      Vaccine positive beliefs. Past research has shown that some individuals support

HPV vaccination because it is beneficial to society. To tap into this construct, a 5-item

scale used by Marlow, Waller and Wardle (2007) to assess parents' perceptions of the

importance of children's vaccines was adapted for use in this study. Items were reworded

to assess participants' beliefs in the positive impact of their own vaccinations, versus the

original scale that assessed parents' perceptions of the importance of vaccinating their

children. Items asked participants about their level of belief that vaccinations protect

against outbreaks, and protect others. Items also assessed beliefs that vaccines contribute

to health, and that failing to get vaccinated puts others at risk. Responses were scored on a

5-point Likert scale that ranged from 1 (strongly disagree) to 5 (strongly agree). The

Cronbach's alpha for the scale used by Marlow and colleagues was .76. In the present study the Cronbach's alpha for the adapted scale was .90.

Perceived Barrier Variables

Vaccine safety fears. Vaccine safety fears were measured with six items that inquired about participants' concerns about vaccines in general, as well as about the HPV vaccine specifically. These items were originally meant to assess two types of safety concerns, those of vaccines in general, and those of the HPV vaccine. However, the items were combined to create one scale due to a high correlation between the two scale scores. Questions asked if participants thought vaccines were safe, and if they worried about side effects. Participants could respond on a scale ranging from 1 (strongly disagree) to 5 (strongly agree). The Cronbach's alpha for this scale was .91. A pilot study that was conducted prior to this research utilized the two safety fear scales. The Cronbach's alpha values for these scales in the pilot study were .76 for the general vaccine safety concern scale, and .81 for the HPV vaccine safety concern scale.

Fear of stigmatization if asking for the vaccine (Fear of Doctor Stigma). Due to the sexually transmitted nature of the HPV virus, it was hypothesized that participants may feel at risk of being stigmatized if they ask a health care provider for the HPV vaccine. To assess these feelings, a ten item likert-type scale was used. Response options ranged from 1 (strongly disagree) to 5 (strongly agree). Items asked participants if they worry their doctor would think they sleep around, have poor morals, would cheat on their romantic partner, are protecting themselves, etc., if they asked for the HPV vaccine. The Cronbach's alpha value for the scale was .92. An earlier version of this scale was used in

the pilot study conducted by this author and yielded a Cronbach's alpha value of .72 in that study.

Brief Sexual Attitudes Scale (SAS). The Brief Sexual Attitudes Scale (Hendrick, Hendrick and Reich, 2006) is a shortened (25 item) version of the original SAS developed by Hendrick and Hendrick (1987). It was used to measure participants' attitudes toward sex. The scale is comprised of four subscales assessing Permissiveness (perceptions of casual sexuality), Birth Control (perceptions of responsible sexuality), Communion (perceptions of idealistic sexuality), and Instrumentality (perceptions of biological/utilitarian sexuality). Responses were recorded on a 5-point Likert scale that ranged from 1 (strongly disagree) to 5 (strongly agree). When Hendrick et al. (2006) assessed the internal reliability of the subscales, they found Cronbach's alpha coefficients for the permissiveness subscale to be .95, for birth control to be .87, for communion to be .79, and for instrumentality to be .80. A total scale score is not computed. The main subscale of interest in the current study was the Permissiveness subscale, where it was found to have a Cronbach's alpha of .92.

STI Stigma and Shame Scale. To measure the level of stigma and shame participants associate with STIs, the STI Stigma and Shame Scales, developed by Fortenberry et al. (2002) were used. These scales are made up of 6 items assessing feelings of shame (original Cronbach's alpha = .80) and five items assessing fears of stigma (original Cronbach's alpha = .77) in situations related to doctor visits for STI related treatment and examination. In this study, responses were recorded on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The items were combined to create one scale score (confirmed as methodologically sound by principal

component factor analysis). The Cronbach's alpha value for the scale in the current study was .92.

Physician Trust Scale. The Wake-Forrest Physician Trust Scale (Hall et al., 2002) was used to measure participants' trust in physicians. The scale is comprised of 10 items assessing various constructs related to physician trust, such as their competency, thoughtfulness, and honesty. This scale has been shown to have comparable internal consistency, reliability, and ranges as other similar measures (Hall et al., 2002). However, the creators of this scale note that their measure also has the benefit of having a lower mean score, a more normal distribution, and better discriminatory power (Hall et al., 2002). Internal reliability was reported as .93 in the original study conducted by the scale authors. Response options ranged from 1 (strongly disagree) to 5 (strongly agree). The Cronbach's alpha value for the scale in the current study was .94.

Pharmaceutical company trust. A 10 item measure to assess participants' trust in pharmaceutical companies was used in this study. It was previously developed for another study conducted by this author. Questions inquired about issues such as trust, employee honesty, profit motivation, and advertising claims. Items were scored on a 5-point Likert scale that ranged from 1 (strongly disagree) to 5 (strongly agree). The Cronbach's alpha value for the scale in the current study was .85. In a pilot study conducted by this author, this scale also had a Cronbach's alpha value of .85.

Access to medical care. Six questions were used to assess participants' access to medical care, and to gather details about their health care provider. Participants were asked if they have a regular family doctor, and if so, what the gender and age of their doctor was. Participants were also asked how comfortable they feel speaking to their

doctor about any health concern (measured on a 5-point Likert scale). If participants did

not have a regular doctor, they were asked if they have access to regular medical care, and

how comfortable they felt speaking to the doctor(s) that they do come into contact with.

Cost. Four questions to assess how the cost of the HPV vaccine might influence

participants' desire to get the vaccine were asked. Response options ranged from 1 (not at

all) to 5 (very much). These four items were used to create a scale score, which was found

to have a Cronbach's alpha of .80.

Insurance. Participants were asked two questions to determine if they had

insurance coverage that would have paid for the HPV vaccine. They were asked if they

have an insurance plan, and if so, if they knew if it covered the vaccine at the time they

considered and made their decision to get vaccinated or not.

Self-Efficacy Variable

Self-efficacy for obtaining the HPV vaccine. A four item scale was used to

assess unvaccinated participants' level of self-efficacy for obtaining the HPV vaccine.

Three of the scale items were taken from a study conducted by Kahn et al. (2008). These

items inquired about participants' belief that they could get all three vaccines, that they

would have time to get the vaccine, and that they would be able to afford it. Kahn et al.

found a Cronbach's alpha of .82 for the scale comprised of these three items. An

additional fourth item was added to this scale for this study, in order to strengthen its

ability to assess self-efficacy for overcoming barriers to HPV vaccination. The item asked

participants if they felt they could "overcome barriers to getting the HPV vaccines".

Responses to all items were measured on a 5-point Likert scale ranging from 1 (very

unlikely) to 5 (very likely). The Cronbach's alpha value for the scale was .81. If the item

that was added for this study was removed from the scale, the Cronbach's alpha of the

original three items was .72, indicating the addition of this item strengthened the scale.

Cues to Action Variable

      Cues to action. Inspired by other HPV vaccine studies, a 10 item scale was

created and used to assess cues that are believed to prompt participants to obtain, or want

to obtain, the HPV vaccine. The 10 items each began with a yes/no statement asking if

participants had experienced a prompt from the subject of the item (e.g., a friend,

romantic partner, school, commercial, news story). If participants indicated that they had,

they were then asked to rate, on a 5-point scale ranging from 1 (made me definitely not

want to get the vaccine) to 5 (made me definitely want the vaccine), how much influence

this prompt had on their desire to want the HPV vaccine. For this study, scores were

computed by assessing how many positive cues to action (cues that encouraged the

individual to get the vaccine) an individual had received. If a cue encouraged an

individual to maybe want the vaccine, one point was awarded. If a cue encouraged an

individual to definitely want the vaccine, two points were awarded. Thus, scale scores

could range from 0 (no positive cues) to 20 (all 10 cues made the individual definitely

want the vaccine).

Subjective Norm Variables

      Subjective norms about HPV vaccination. An eight item measure was used to

assess participants' beliefs in the social norms surrounding HPV vaccination. The

measure was inspired by one developed and used by Buchanan (2008). It was comprised

of eight items listing eight different significant others or groups, and asked participants to

indicate whether they believed the significant other or group would endorse HPV

vaccination or not. Responses were recorded on a five-point likert scale ranging from 1 (I definitely should not get the HPV vaccine) to 5 (I definitely should get the HPV vaccine). The Cronbach's alpha value for the scale was .89.

Open-Ended Question

An open ended question was placed at the end of the study questionnaire in order to provide participants with an opportunity to provide additional information about reasons why they have or have not gotten the HPV vaccine. Participants were asked to: "Please describe all of the reasons why you have or have not gotten the HPV vaccine."

Outcome Measures

Actual vaccine obtainment. To determine if participants had received the HPV vaccine or not, they were asked if they had obtained any of the HPV vaccine shots. Individuals could indicate if they had or not, and if so, they were asked to indicate how many of the shots they had received. Individuals were considered to have been vaccinated if they received at least one shot.

Desire to get the HPV vaccine. Non-vaccinated participants were asked to indicate on a five-point scale ranging from 1 (definitely not like to) to 5 (definitely would like to), how much they would like to get the HPV vaccine, regardless of whether they think they actually will.

Actually think will get the vaccine. Non-vaccinated participants were also asked how likely they are to actually get the HPV vaccine. Responses were recorded on a five-point likert scale ranging from 1 (very unlikely) to 5 (very likely).

Procedure

This study was approved by the Research Ethics Board at the University of Windsor. Data were collected in the Fall of 2011. Participants were recruited for this web-based study in three ways: (1) The University of Windsor psychology participant pool website, (2) Email snowball sampling, and (3) The social networking site Facebook. Individuals who were recruited through the psychology participant pool were able to view a description of the study online through the participant pool system, and were able to choose to sign up to participate. If individuals signed up for this study, they were given access to the study website where they could complete the study at any time within a one week time frame. Individuals who were recruited through email snowball sampling received an email which contained a description of the study and a link to the study website. The author sent out the original email message to family and friends with the request that the email be forwarded on. The third method used to recruit participants was through Facebook. A Facebook "page", describing the study and providing potential participants with the web link to the study, was developed. Facebook users could have found this page through a variety of methods. For instance, individuals conducting key word searches could have located the page and viewed it (e.g., HPV Vaccine, HPV Canada), but probably the most effective method of Facebook recruitment was through requests to participate in the study that were sent out by this author, to Facebook Friends, which included a request to forward the study page information on to eligible women.

Incentives for participation varied depending upon how participants learned of the study. Women who were registered in the psychology participant pool received one bonus point in an eligible psychology class in exchange for their participation. Women who

learned of the study through any of the other methods were offered the chance to enter a random draw for two $250 Amazon.ca gift cards. The gift cards were sent electronically to the winners' email addresses.

This study was hosted on-line through the web survey provider FluidSurveys. FluidSurveys stores collected data within Canada, ensuring that data is stored securely and can be accessed only by survey creators. The first web page participants encountered when they clicked on the study web link was the "Letter of Information to Participate in Research" page. Participants were required to indicate that they had read the letter before they could continue to the next study page, complete screening questions, and if eligible to participate, begin the questionnaire.

Once participants had completed the study questionnaire they were asked if they would like to provide their information to receive the type of compensation advertised to them in the study recruitment materials (bonus point or draw entry). If participants chose to provide their personal information, they were routed to a new FluidSurvey that collected their information and stored it in a new, separate database from their questionnaire data. This was done to ensure that survey data could not be linked to participants' names or email addresses.

Data Analysis

The data analytic strategy for this study included logistic regression and multiple regression analyses, as well as testing the proposed modified Health Belief Model presented earlier in this paper through Structural Equation Modeling (SEM). To begin, logistic regression analyses were conducted to investigate the relationships between the variables assessing each of the study's model components (e.g., Perceived Severity,

Perceived Benefits), and a dichotomous outcome variable: vaccination status (have received the HPV vaccine or have not received the HPV vaccine). Following these logistic regressions, the rest of the analyses conducted used only the data from women who had never been vaccinated.

Two sets of multiple regression analyses were conducted next. The intent was to examine factors that predict intentions to receive the HPV vaccine. The first group of multiple regressions investigated the relationships between the variables assessing the model components, and an outcome variable that asked participants if they would like to get the HPV vaccine, with possible responses ranging from one to five. The second group of multiple regressions investigated the relationships between the component variables and an outcome that asked participants if they actually thought they would get the vaccine, regardless of whether they wanted it or not. This outcome variable was also measured on a five-point scale.

Following the examination of direct relationships between the proposed predictor variables and the various outcomes, structural equation modeling was used to test the modified Health Belief model of HPV vaccination intentions that was proposed in this study. See Figure 1 to review this model.

Chapter III

Results

Data Screening

In order to participate in this study, individuals had to meet specific criteria. A participant had to be a woman, living in Canada, aged 18 to 30. The first page of the study website, which described the purpose of the study and the participation criteria, was visited by 458 individuals. Of these visitors, 394 people met the participation criteria and began the survey. Not all individuals who began the survey completed it. In total, 374 women, or 94.9% of those who began it, completed the survey.

Data was screened for outliers by examining boxplots and comparing means of the total sample to means of a 5% trimmed sample (removing individuals with the top 2.5% and the bottom 2.5% of values). Boxplots revealed that while a few individuals (e.g., 2-10 people) had outlying scores on some variables, that no one individual was responsible for many outlying scores. When total sample means and 5% trimmed means were examined, it was found that mean scores either did not change, or changed very little. Thus, it was decided that no participants would be removed due to outlying responses. Missing data was also not a problem for the 374 women who completed the survey. While some questions could only be answered by a portion of the sample based on their answers to previous survey questions (e.g., questions about Pap testing could only be answered by individuals who had ever had a Pap test), for questions in which all individuals could provide responses, very little missing data was detected. Thus, again, no individuals had to be removed from the final dataset. Graham (2009) states that if 5% or less of data is missing, that listwise deletion is an acceptable approach to dealing with missing data. As

this was the case with this dataset, listwise deletion was used when conducting descriptive and regression analyses in SPSS. Because SEM modeling requires complete data, for any missing cases (which were minimal) mean substitutions were used.

Tests of scale score normality (kurtosis) were also conducted. Byrne (2010) states that for the purposes of SEM that a kurtosis score greater than 5.0 should be considered non-normal. Based on this this rule, no scales were found to have non-normal distributions.

Factor Analysis and Reliability of Study Measures

Due to the lack of validated scales to measure the various constructs under investigation, many of the measures used in this study had to be adapted from previous research or were designed specifically for this project. Because of this, it was important to ensure that these created scales were factor analysed. All created scales were analysed using principal components factor analysis without rotation, and it was found that with the exception of the scales assessing (1) participant concern about experiencing stigma if asking a doctor for the HPV vaccine (Fear of Doctor Stigma), and (2) subjective norms assessing how much others influence the participants' behaviours (HPV Subjective Norms), that all of the scales proved to be unidimensional measures of the constructs they were intended to assess. Specifically, all scales had items that loaded on Factor 1 with values of at least .35 and no strong loadings on another factor. After examining the factor structure of the Fear of Doctor Stigma scale, it was decided that the two items that did not load onto the primary factor be removed, reducing the scale from 12 items to 10. The Fear of Doctor Stigma Scale asks participants "If I asked my doctor for the HPV vaccine, the doctor would think…". The two items that were removed were "nothing of it" and "that I

want to protect my sexual partners". The HPV Subjective Norm scale was also strengthened by removing the one item that did not load adequately, reducing this scale from eight to seven items. The item that was removed inquired about the opinions of religious organization members in the participants' life. After these changes were made, the scale items for each of the two measures were factor analysed again. The results revealed that for each measure, all items now loaded well onto one factor.

Cronbach's alpha reliability coefficients were computed for all scales. Please see Table 2 to view Cronbach's alpha values for each scale, the scale possible range and actual range, and the scale mean and standard deviation. All values were acceptable (Cronbach's alpha > .70), except for the value for the HPV vaccine knowledge scale, which had a Cronbach's alpha value of .66. Due to its lower value, and because research has found mixed results when investigating the relationship between knowledge variables and HPV outcomes variables, the decision was made to exclude this scale from analysis. Because there were two knowledge scales used in this study, HPV knowledge and HPV vaccine knowledge, one scale was still available to represent the knowledge component of the theoretical model, and thus the exclusion of the vaccine knowledge scale did not hinder the ability to test the proposed theoretical model.

In order to ensure that scale intercorrelations were not too high, leading to multicollinearity, correlations were computed between all continuous variables (see Table 3). Only two scales were found to be highly correlated. These scales were the scale assessing general vaccine safety fears and the scale assessing HPV vaccine safety fears (r = .69). As mentioned in the Measures section, due to this high correlation, and because of the conceptual similarity between the two scales, the items that comprised them

Table 2

Cronbach's Alpha Values, Scale Ranges, and Scale Means and Standard Deviations for Scales used in Analyses

Measure	Cronbach Alpha	Possible range	Actual range	Mean	Standard deviation
HPV Knowledge	.84	0-24	0-24	14.47	4.49
HPV Vaccine Knowledge	.66	0-7	0-7	5.01	1.47
Susceptibility	.88	1-5	1-5	1.89	0.88
General Severity	.73	1-5	2.8-5	4.48	0.56
Treatment Severity	.80	1-5	1.2-5	4.28	0.66
Social Severity	.88	1-5	1-5	4.05	0.94
HPV Vaccine Effectiveness	.94	1-5	1-5	3.36	1.04
Vaccines Positive Beliefs	.90	1-5	1-5	3.71	0.88
Fear Cervical Cancer	.94	1-5	1.25-5	3.51	0.94
Safety Concerns	.91	1-5	1-5	3.37	0.90
Asking Dr. Stigma	.92	1-5	1-4.3	1.82	0.66
SAS Permissiveness Subscale	.92	1-5	1-4.4	2.02	0.81
STI Sigma and Shame	.92	1-5	1-4.91	2.41	0.82
Physician Trust	.94	1-5	1-5	3.55	0.85
Pharmaceutical Company Trust	.85	1-5	1-4.6	2.85	0.58
HPV Vaccine Cost	.80	1-5	1-5	2.12	1.21

Measure	Cronbach Alpha	Possible Range	Actual Range	Mean	Standard Deviation
Vaccination Self Efficacy	.81	1-5	1-5	3.54	0.90
HPV Vaccine Subjective Norms	.89	1-5	1-5	3.26	0.65
Positive Cues to Action	-	0-20	0-14	2.34	2.78

Table 3

Correlations Between Continuous Study Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Desire Vac	1												
2 Actually Think Vac	.78**	1											
3 HPV Knowledge	-.08	-.10	1										
4 Susceptibility Scale	.16*	.03	.29**	1									
5 General Severity	.01	.11	-.20**	-.14*	1								
6 Treatment Severity	-.05	-.01	-.19**	-.07	.58**	1							
7 Social Severity	-.02	.05	-.18**	-.10	.47**	.52**	1						
8 Fear Cerv Cancer	-.08	.02	-.10	.10	.32**	.31**	.26**	1					
9 Vac Effectiveness	.67**	.61**	-.13*	.06	.14*	.12	.12	.05	1				
10 Vac Pos Beliefs	.54**	.42**	-.12	.05	.12	.09	.08	.06	.50**	1			
11 Safety Concerns	-.42**	-.25**	-.09	-.05	.22**	.27*	.20**	.31**	-.24**	-.43**	1		
12 SAS Perm	.13	.03	.33**	.31**	-.30**	-.20**	-.27**	-.20**	.06	.02	-.18**	1	
13 Stigma And Shame	-.05	.02	-.36**	-.17*	.22**	.28**	.44**	.27**	-.02	.13	.14*	-.30**	1
14 Physician Trust	.15*	.25**	-.08	-.15*	.12	.03	.13	-.04	.22**	.18**	-.11	-.15*	-.04
15 Pharm Trust	.34**	.23**	-.15*	-.12	.11	.04	.08	-.03	.29**	.32**	-.34**	-.09	.00
16 Vac Cost	.17*	.02	-.10	.10	-.01	.00	.08	.02	.21**	.14*	-.07	.07	.01
17 Fear Dr. Stigma	-.15*	-.14*	-.11	-.02	.07	.05	.12	.09	-.18**	.00	.05	-.04	.36**
18 Pos Cues Action	.63**	.58**	-.03	.15*	.07	-.01	.05	.06	.50**	.37**	-.20**	.06	-.04
19 Self-Efficacy	.39**	.39**	.05	.03	-.03	-.05	-.05	-.17**	.39**	.26**	-.24**	.18**	-.11
20 Subjective Norms	.54**	.52**	.02	.10	.00	-.05	.05	-.05	.45**	.29**	-.29**	.09	-.08

Note. *p < .05, ** p < .01.

	14	15	16	17	18	19	20
1 Desire Vac							
2 Actually Think Vac							
3 HPV Knowledge							
4 Susceptibility Scale							
5 General Severity							
6 Treatment Severity							
7 Social Severity							
8 Fear Cerv Cancer							
9 Vac Effectiveness							
10 Vac Pos Beliefs							
11 Safety Concerns							
12 SAS Perm							
13 Stigma And Shame							
14 Physician Trust	1						
15 Pharm Trust	.28**	1					
16 Vac Cost	-.03	.06	1				
17 Fear Dr. Stigma	-.16	-.07	.10	1			
18 Pos Cues Action	.22**	.26**	.05	-.18**	1		
19 Self-Efficacy	.10	.27**	-.26**	-.17*	.34**	1	
20 Subjective Norms	.16*	.27**	.11	-.26**	.47**	.40	1

Note. *p < .05, ** p < .01.

were combined in order to create one scale score to assess vaccine safety fears (this combined scale score represents the variable called Vaccine Safety Concern within this document). No correlations between any of the other scale predictor variables were found to be high.

Sample Characteristics

Recruitment source. Participants were asked how they found out about this study. Of those who answered this question, 298 found out about it through the university psychology participant pool (79.7% of the sample), and 73 found out about it online through Facebook or email (19.5% of the sample). Three people did not answer this question.

Romantic relationships and sexual history. The majority of participants, 94.4% of the sample, reported that they were heterosexual, 3.7% were bisexual, 0.3% were lesbian, and 1.1% reported their sexual orientation as "other". For those individuals who reported that they were bisexual, 12 out of the 14 women had had a male sexual partner as their most recent partner. The majority of study participants were either single and not dating (27.5%), or in a committed dating relationship but not living together (38.8%). A fairly equal proportion of the remaining participants were either single and dating (14.4%), cohabitating with a partner but not married (8.8%), or married (10.4%). The average reported relationship length was 3.59 years ($SD = 2.87$). When asked if they had ever engaged in any type of sexual activity (touching, intercourse, other activities), 84% of participants indicated that they had. The number of reported sexual partners an individual had ever had any type of sexual contact with ranged from 1 to 45, with a mean of 5.12 ($SD = 5.66$). When vaginal intercourse was inquired about specifically, 72.7% of

individuals reported that they had had vaginal intercourse. The average age at which

vaginal intercourse first took place was 17.38 ($SD = 2.10$), and the mean number of

partners a woman had had was 4.23 ($SD = 5.05$). Participants were also asked about their

experiences with anal intercourse, and 19.5% of the women reported that they had

engaged in this type of sexual activity. The average age of first anal intercourse was 19.48

($SD = 2.56$), and the mean number of partners was 1.39 ($SD = 0.72$). Condom use with

past and present sexual partners was also investigated. With past partners, 4.4% of

women who had had vaginal intercourse reported that they never used condoms, 10.7%

reported they did not use them often, 9.2% reported they used them half of the time,

22.1% reported they used them most of the time, and 26.5% of participants always used

them. With current partners, 30.5% of participants did not use condoms, 10.7% did not

often use them, 6.6% of participants reported they used them half the time, 14% reported

they used them most of the time, and 26.5% reported they always used them.

   Sexual health. Participants were asked if they had ever had a Pap Smear test.

Surprisingly, only 59.6% of the sample had ever had a Pap test (39.3% of individuals had

never had one, and 0.2% of the women were unsure). To investigate this further, the

proportion of women who had had vaginal intercourse and who had ever had a Pap test

was analysed. Results revealed that 78.7% of women who had had vaginal intercouse had

had a Pap test. When participants were asked if they had ever had an abnormal Pap test,

47 women (12.6% of all participants) reported that they had. Women who had had an

abnormal Pap test were asked to indicate the highest level of intervention that they had

received as a result of their abnormal test. Twenty women reported that they had a follow-

up Pap test, 12 women had a colposcopy, and nine women had abnormal cells removed.

Five women reported other outcomes such as: requiring yearly biopsies, nothing being done, and currently awaiting follow-up appointments.

Whether individuals had ever had an STI was also investigated. Only 4.5% of participants (17 women) reported that they had ever had an STI (0.8% reported they were unsure if they had ever had one). When asked about HPV or genital wart infection specifically, 3.7% of participants (14 women) reported that they had been diagnosed with this STI.

HPV Vaccine Obtainment

Participant vaccination rates. One of the main objectives of this study was to investigate factors that predict HPV vaccine obtainment. For the purposes of the following analyses, obtainment was defined as a participant having obtained at least one HPV shot. The majority of study participants had not received an HPV vaccine shot. More specifically, 269 people had not received the vaccine (71.9% of the sample), while 101 women had (27.0% of the sample). Of those who had received the vaccine, 75 women (74.26% of those who received at least one shot) reported getting all three shots, 12 reported getting two (11.88%), and 11 (10.89%) reported getting one. The majority of women who reported that they had received only one shot reported that they would not be going back for any more, while the majority of women who reported that they had received two shots reported that they would be finishing the series. A summary of these vaccination rates, as well as a summary of the reasons given for not wanting to continue to be vaccinated, is presented in Table 4.

Table 5 presents a summary of key demographic and relationship and sexual history variables based upon HPV vaccination status. Chi square analyses and t-tests were

Table 4

Summary of Participant Vaccination Rates

	N (% of sample)
Vaccine Obtained	
No	269 (71.9)
Yes	101 (27.0)
Number of Shots Obtained	
One	11 (2.9)
Two	12 (3.2)
Three	75 (20.1)
Reasons For Not Completing HPV Vaccine Series	
No time	9
Decided not important	4
Cost	3
No consistent health care provider	3
Read a story about the vaccine online	2
Negative side effect	1
Afraid of needles	1
Friend or family did not want me to continue	1

Note. An individual was classified as having obtained the vaccine if they reported receiving any number of shots.

used to test for possible group differences based on the key demographic variables. Please see Table 5 to review the results of these tests.

HPV vaccine obtainment: Logistic regression analyses. In order to examine the impact that the study variables have on actual vaccination behaviours, logistic regression analyses investigating the predictive ability of the variables representing each model component except for self-efficacy which was not assessed in participants who had received the vaccine, were conducted. Thus, seven logistic regressions, one for each model component (Knowledge, Susceptibility, Severity, Benefits, Barriers, Cues to Action, and Subjective Norms) were conducted, with actual vaccination status (whether one obtained at least one shot of the vaccine or not) as the dichotomous outcome variable.

Knowledge. A logistic regression was run to examine whether HPV knowledge predicted HPV vaccination behaviour. The logistic regression revealed that HPV knowledge scores did not predict whether women received the HPV vaccine or not, model χ^2 (1, $N = 370$) = 1.50, $p > .05$.

Perceived Susceptibility. It was predicted that a number of relationship variables (relationship status and relationship length), a gynecological variable (ever having had an abnormal Pap test), and sexual history experiences (ever having engaged in vaginal or anal intercourse, number of vaginal or anal sexual partners), as well as scores on the HPV Susceptibility Scale would be related to HPV vaccine obtainment. Because some relationship, sexual, and gynecological health history questions were not applicable to all individuals (e.g., those who had never had sex were unable to indicate a number of individuals that they had intercourse with), multiple logistic regressions were conducted to test this model component, rather than just one. This was done in order to ensure a

Table 5

Demographic, Relationship, and Sexual History Information by HPV Vaccination Status

	Vaccine Obtained N = 101	Vaccine Not Obtained N = 269	
	N (% of sample)	N (% of sample)	χ^2
			1.27
Relationship status			
Single	24 (23.8)	78 (29.0)	
Dating	17 (16.8)	37 (13.8)	
Committed Relationship	60 (59.4)	154 (57.2)	
Yes, have engaged in sexual activity	89 (88.1)	222 (82.5)	1.23
Yes, have had a Pap Test	72 (71.3)	149 (55.4)	6.93*
Have had an abnormal Pap	18 (17.8)	28 (10.4)	1.26
Told have HPV	4 (4.0)	9 (3.3)	n/a
	Mean (*SD*)	Mean (*SD*)	*t*
Age	21.2 (2.84)	22.37 (3.71)	3.23*
Relationship length in years	2.72 (2.12)	3.92 (3.07)	3.06*
Age first vaginal intercourse	16.84 (1.57)	17.59 (2.22)	3.15*
Number of vaginal intercourse partners	4.42 (4.19)	3.72 (5.30)	1.09

Note. An individual was classified as having obtained the vaccine if they reported receiving any number of shots. * $p < .01$.

large enough sample size for the analyses. Only two susceptibility variables were found to individually predict HPV vaccine obtainment: relationship length, and whether an individual had ever had vaginal intercourse. These two variables were then entered into a logistic regression together in order to determine whether both still predicted vaccine obtainment. The tested model was significant. Model χ^2 (2, $N = 222$) = 9.84, $p < .01$, Hosmer & Lemeshow R^2 = 8.74, p > .05, .04 (Cox & Snell), .06 (Nagelkerke). Relationship length negatively predicted HPV vaccination behaviours (B = -0.01, $p < .05$), and vaginal intercourse status positively predicted HPV vaccination status (B = 1.12, $p = .05$). Individuals who had had vaginal intercourse were three times more likely to receive the HPV vaccine than those who had never had vaginal intercourse, odds ratio = 3.08, 95% CI [0.99, 61.42]. Meanwhile, as relationship length increased, the odds of having the HPV vaccine diminished slightly, odds ratio = 0.99, 95% CI [0.98, 1.00]. Predictive success of the model was 72.1%.

Perceived Severity. A logistic regression was run to determine if scales assessing participants' perceptions of the severity of HPV in general, HPV treatment, and HPV's social impact, as well as fears of cervical cancer, were predictive of vaccine obtainment. The model investigating these severity measures was not significant, χ^2 (4, $N = 367$) = 6.78, $p > .05$. An examination of the predictive ability of each of the individual measures was conducted and it was found that perceptions of the severity of HPV vaccine treatment did significantly impact HPV vaccination decisions (B = 0.51, $p < .05$). For every point increase in perceptions of the severity of HPV treatment, the likelihood that an individual would get vaccinated increased approximately one and half times, odds ratio = 1.68, 95% CI [1.05, 2.67].

   Perceived Benefits. The impact that beliefs about the effectiveness of the HPV

vaccine (Vaccine Effectiveness), and beliefs about the benefits of vaccination (Vaccine

Positive Beliefs), have on actual HPV vaccination behaviours was investigated next. It

was found that the model that included both of these variables significantly predicted

HPV vaccination behaviours, Model χ^2 (2, $N = 368$) = 77.41, $p < .01$, Hosmer &

Lemeshow R^2 = 12.44, $p > .05$, .19 (Cox & Snell), .27 (Nagelkerke). Predictive success of

the model was 75.0%. Both scales assessing benefits were found to be positively

predictive. As participants' beliefs that the HPV vaccine would effectively reduce HPV

infection increased (B = 0.92, $p < .01$), and as beliefs that vaccinations are beneficial to

society increased (B = 0.45, $p < .05$), the likelihood that an individual would get

vaccinated increased. For each scale point that beliefs about the effectiveness of the HPV

vaccine increased, the likelihood that an individual would get the HPV vaccine increased

2.52 times, 95% CI [1.78, 3.56]. For each scale point that beliefs that vaccines are

beneficial for society increased, the likelihood that an individual would get the vaccine

increased 1.57 times, 95% CI [1.07, 2.30].

   Perceived Barriers. There were many barriers to HPV vaccination that were

predicted to influence inoculation behaviours. The following variables were entered into a

logistic regression model as possible predictors: Pharmaceutical Company Trust,

Physician Trust, STI Stigma and Shame, Fear of Doctor Stigma, access to a health care

professional, the Permissiveness subscale of the Sexual Attitudes Scale, HPV Vaccine

Safety Fears, Vaccine Cost, and having insurance that would pay for the vaccine. It was

found that the model was predictive of HPV vaccination behaviours, Model χ^2 (9, $N =$

336) = 159.25, $p < .01$, Hosmer & Lemeshow R^2 = 11.00, $p > .05$, .38 (Cox & Snell), .54

(Nagelkerke). An examination of the possible predictors revealed that three of the variables significantly predicted vaccination uptake: HPV Vaccine Safety Fears (B = -1.49, $p < .01$), Fear of Doctor Stigma (B = -1.07, $p < .01$), and whether the vaccine was covered by insurance (B = -2.55, $p < .01$). In addition, one variable approached significance: STI Stigma and Shame (B = 0.40, $p = .58$). Prediction success of the model was 84.8%. When the influence that HPV Vaccine Safety Fear has on HPV vaccination behaviours was examined, it was found that as concern about the safety of vaccines increased, the likelihood that an individual would get vaccinated decreased, odds ratio = 0.23, 95% CI [0.15, 0.35]. Relatedly, as concern that physicians would have negative opinions about the participant if they asked for the HPV vaccine increased (Fear of Doctor Stigma), the likelihood that an individual would get the HPV vaccine decreased, odds ratio = 0.34, 95% CI [0.19, 0.62]. Individuals who did not have insurance that covered the vaccine were less likely to get vaccinated, odds ratio = 0.08, 95% CI [0.04, 0.16]. Finally, the impact of participant's beliefs about the stigma and shame associated with STIs and its impact on HPV vaccine behaviour approached significance. As perceptions of stigma and shame increased (become more negative), the likelihood of getting vaccinated decreased, odds ratio = 1.50, 95% CI [0.99, 2.27].

Cues to Action. A logistic regression was conducted to investigate whether Positive Cues to Action would predict HPV vaccination behaviour. Results indicated that cues to action did predict vaccination behaviours, Model χ^2 (1, N = 346)= 68.11, $p < .01$, Hosmer & Lemeshow R^2 = 11.97, $p < .05$, .18 (Cox & Snell), .26 (Nagelkerke). Predictive success of the model was 76.3%. Positive Cues to Action positively influenced vaccination behaviour (B = 0.38, $p < .01$). As the number of positive cues increased, there

was a greater likelihood that an individual would receive the HPV vaccine, odds ratio = 1.46, 95% CI [1.32, 1.62].

Subjective Norms. Finally, it was predicted that Subjective Norm scores would predict actual HPV vaccination outcomes. The model testing this prediction was significant, Model χ^2 (1, N = 368) = 72.38, $p < .01$, Hosmer & Lemeshow R^2 = 30.18, $p < .01$, .18 (Cox & Snell), .26 (Nagelkerke). Predictive success of the model was 77.4%. As Subjective Norm scores increased (indicating more positive norms), individuals were more likely to get the HPV vaccine, odds ratio = 6.03, 95% CI [3.74, 9.74].

Final logistic regression model of all significant predictors. With the number of possible predictor variables within each component narrowed down, it was then possible to conduct a logistic regression on all variables that had been found to significantly predict vaccine behaviours. The only variable that was excluded from this analysis was relationship length, because its inclusion resulted in too small of a sample size to adequately test for effects. The following variables were entered as possible predictors of HPV vaccine obtainment: whether an individual had had vaginal intercourse, perceptions of the severity of HPV treatment (Treatment Severity), Vaccine Effectiveness, Vaccine Positive Beliefs, HPV Vaccine Safety Fears, Fear Doctor Stigma, whether the vaccine is covered by insurance, STI Stigma and Shame, Positive Cues to Action, and Subjective Norms. The results of the analysis revealed that the model was predictive, Model χ^2 (10, N = 340) = 197.71, $p < .01$. Predictive success of the model was 87.9%. The variables that maintained their predictive power were: Treatment Severity, HPV Vaccine Safety Fears, Fear of Doctor Stigma, and whether the vaccine was covered by insurance. Positive Cues to Action also approached significance as a predictor. As perceptions of the severity

of HPV treatment and positive cues to action increased, individuals were more likely to get the vaccine. As fear of doctor stigma and vaccine safety concerns increased, the likelihood that an individual would get vaccinated decreased. And finally, individuals who had insurance were more likely to get the vaccine. Please see Table 6 for a summary of the model statistics.

Predictors of Intentions to Receive the HPV Vaccine for Those Who are Not Vaccinated

Participants who had not received any HPV vaccine shots (N = 269) were asked two related questions to assess their intentions to obtain the HPV vaccine: (1) how much would you like to get the HPV vaccine (regardless of whether you think you actually will), and (2) How likely are you to actually get the vaccine? Participants could respond on a five-point likert scale that ranged from one (definitely not like to/very unlikely) to five (definitely would like to/very likely). The mean responses to both questions, in general, revealed a lack of interest in obtaining the vaccine. Individuals were more likely to want to get the vaccine ($M = 2.88$, $SD = 1.19$), than they were to actually think they would get it ($M = 2.48$, $SD = .08$). In order to verify that these two outcome measures were indeed measuring separate constructs, a Pearson correlation analysis and t-test was conducted. The two items were found to have a high correlation, $r = .79$, $p < .001$. The students t-test was also significant, $t(265) = 8.55$, $p < .001$, indicating that although the items are related, they do assess unique aspects of intentions to vaccinate.

Desire to Get the Vaccine.

Due to the large number of possible predictor variables proposed in this study, the first step in investigating predictors of participants' desire to get the HPV vaccine was to

Table 6

Logistic Regression Results: Predictors of Actual HPV Vaccination Behaviour (N = 340)

| | B (SE) | 95% CI for Odds Ratio | | |
		Lower	Odds Ratio	Upper
Constant	0.30 (2.02)			
Vaginal intercourse	-0.33 (0.47)	0.29	0.72	1.80
Severity of HPV treatment	0.99 (0.36)**	1.33	2.68	5.42
HPV vaccine effectiveness	0.39 (0.25)	0.91	1.48	2.39
Vaccine benefits	-0.10 (0.26)	0.54	0.91	1.52
Vaccine safety	-1.46 (0.27)**	0.14	0.23	0.39
Fear stigma from doctor	-1.20 (0.36)**	0.15	0.30	0.61
Insurance covered	-2.37 (0.39)**	0.04	0.09	0.20
STI stigma and shame	0.38 (0.23)	0.93	1.46	2.31
Cues to action	0.15 (0.08)*	1.00	1.17	1.37
Subjective norms	0.07 (0.34)	0.55	1.08	2.10

Note. Model χ^2 = 197.71, $p < .01$, Hosmer & Lemeshow R^2 = 7.56, $p > .05$, .44 (Cox & Snell), .64 (Nagelkerke). * $p = .057$. ** $p < .01$.

conduct various multiple regressions in an effort to narrow down the number of predictor

variables before a final regression model combining the various theoretical components

was tested. These initial regressions were organized to test the variable(s) assessing each

theoretical component. For most of the model components, one multiple regression

analysis containing all of the possible predictor variables in that component was run.

However, for the Susceptibility component, because the variables had varying sample

sizes, various regressions had to be run for each of these possible predictor variables.

In order to investigate the predictive ability of the Knowledge component of the

theoretical model being tested, a regression was run with HPV Knowledge scores as the

predictor, and Desire to Get the HPV Vaccine (on a scale of 1 to 5) as the outcome. The

regression was not significant, $F(1,265) = 0.52$, $p > .05$.

To investigate the Susceptibility component of the theory, various linear

regression analyses were conducted. Because variables assessing this component include

a lot of dichotomous predictors that represent life experiences (e.g., ever having had

vaginal intercourse, ever having had an abnormal pap, relationship status), in order to

ensure an adequate sample size for the analyses, separate regressions were run for each

predictor. A regression was run with each of the following variables as a predictor, and

desire to get the HPV vaccine as the outcome: Relationship status (single or in a

relationship), Pap test status (ever have an abnormal test or not), vaginal intercourse

status (have had or have not had), anal intercourse status (have had or not had), number of

vaginal sexual partners, number of anal sexual partners, Susceptibility Scale scores, and

relationship length. Two susceptibility variables were found to be predictive of a

desire to get the HPV vaccine: Susceptibility Scale scores, $F(1,265) = 8.05, p < .01$,

adjusted R square $= .03$, and relationship length $F(1,265) = 4.74, p < .05$, adjusted R

square $= .01$. As susceptibility scores increase, desire to get the vaccine also increases (β

$= .17, p < .01$), and as relationship length increases desire to get the vaccine decreases (β

$= -.13, p < .05$).

Next, the impact of the variables assessing the Severity component of the theory

was tested with one multiple regression, with Desire to Get the Vaccine as the outcome

variable and the following variables as predictors: Score on the General Severity scale,

score on the Treatment Severity scale, score on the Social Severity scale, and score on the

Fear of Cervical Cancer scale. None of the variables in this model were found to be

predictive of participants' desire to get the vaccine, $F(4,259) = 0.38, p > .05$.

To test the variables assessing the Benefits component of the theory used in this

study, a multiple regression was conducted with scores on the Vaccine Positive Beliefs

scale, and the Vaccine Effectiveness scale as predictors. The model testing both of these

predictors was significant, $F(2,262) = 115.49, p < .001$, adjusted R square $= .46$. An

examination of standardized beta values revealed that perceptions of the effectiveness of

the HPV vaccine ($\beta = .51, p < .001$), and vaccine positive beliefs ($\beta = .26, p < .001$),

predicted desires to get the HPV vaccine. As beliefs about the effectiveness of the vaccine

and vaccine positive beliefs increase, desires to get the vaccine also increase.

The Barrier component of the theory was tested by running one multiple

regression analysis using the following predictor variables: Pharmaceutical Company

Trust, Physician Trust, STI Stigma and Shame, Fear of Doctor Stigma, Permissiveness

subscale of the Sexual Attitudes Scale, regular healthcare provider status (have one or

don't have one), availability of insurance to cover costs, and perceptions about the cost of the HPV vaccine (Vaccine Costs). The model was significant, $F(9,229) = 8.97, p < .001$, adjusted R square $= .23$. An examination of standardized beta weights revealed that the following were significant predictors: HPV Vaccine Safety Fears ($\beta = -.30, p < .001$), Pharmaceutical Company Trust ($\beta = .22, p < .01$), Vaccine Costs ($\beta = .13, p < .05$), and Fear of Doctor Stigma ($\beta = -.12, p < .05$). As Concerns about the safety of the vaccine and fear of doctor stigma increase, desires to get the vaccine decrease. As trust for pharmaceutical companies increase, desires to get the vaccine also increase, revealing that low levels of trust will lead to less desire to get vaccinated. And finally, as concerns about the cost of the vaccine increases, desire to get the vaccine also increases.

The remaining three components of the theoretical model being tested in this study, Cues to Action, Self-Efficacy, and Subjective Norms, were each tested with their own multiple regression analysis, each with one predictor variable: Positive Cues to Action for the Cues to Action regression, feeling of efficacy for the Self-Efficacy regression, and Subjective (Social) Norms surrounding HPV vaccination for the Subjective Norms regression. Each of the three regressions were significant: Cues to Action $F(1,246) = 166.22, p < .001$, adjusted R square $= .40$, Self-Efficacy $F(1,261) = 49.20, p < .001$, adjusted R square $= .16$, and Subjective Norms $F(1,265) = 107.99, p < .001$, adjusted R square $= .29$. As cues to action ($\beta = .64, p < .001$), self-efficacy ($\beta = .40, p < .001$), and subjective norms ($\beta = .54, p < .001$) increased, desire to get the vaccine increased.

Multiple regression of all significant predictors. The significant predictors from each theoretical component that were identified in the regressions above, were then

entered into a final multiple regression model in order to investigate which variables would still significantly predict Desire to Receive the HPV Vaccine, when all possible contributing variables were taken into account. Using the Enter method, a significant model emerged $F(11,212) = 37.15$, $p < .001$, adjusted R square $= .64$. Variables that were found to still significantly predict participants' desire for the HPV vaccine were: beliefs about vaccine effectiveness, thoughts about HPV vaccine safety, Positive Cues to Action, Vaccine Positive Beliefs, and Subjective Norms. Results revealed that as beliefs about the effectiveness of the HPV vaccine ($\beta = .31$, $p < .001$), Positive Cues to Action ($\beta = .29$, $p < .001$), social norms encouraging the vaccine ($\beta = .14$, $p < .01$), and Vaccine Positive Beliefs (that vaccines in general are useful) ($\beta = .13$, $p < .05$) increased, so too did a desire to get the HPV vaccine. Meanwhile, as worry about the safety of the HPV vaccine increased ($\beta = -.18$, $p < .001$), desire to get the vaccine decreased. See Table 7 for a summary of these findings.

Actually Think they Would get the Vaccine

An analysis of predictors of whether participants believe they will *actually* get the vaccine was conducted next. The analysis was conducted in the same fashion as the analysis of the question assessing desire to get the vaccine, with various initial regressions being run to test predictors for each model component, and then conducting a final multiple regression with all significant predictors.

To begin, a regression testing whether HPV Knowledge is predictive of participants' belief they would actually get the vaccine was conducted. This regression was not significant, $F(1,265) = 1.23$, $p > .05$, indicating that HPV knowledge was not predictive of these vaccination intentions.

Table 7

Multiple Regression Results: Predictors of a Desire to Obtain the HPV Vaccine (N = 224)

	B	SE B	β	sr^2
Constant	0.28	0.63		
HPV vaccine effectiveness	0.37	0.07	.31**	.05
Vaccine safety	-0.26	0.07	-.18**	.02
Cues to action	0.16	0.03	.29**	.05
Susceptibility scale	0.09	0.06	.07	.00
Vaccine positive benefits	0.18	0.07	.13*	.01
Pharmaceutical trust	0.06	0.10	.03	.00
Fear stigma from doctor	0.01	0.08	.01	.00
Vaccine cost	0.04	0.04	.04	.00
Vaccination efficacy	0.06	0.07	.04	.00
Subjective social norms	0.29	0.10	.14**	.01
Relationship length	-0.00	0.00	-.05	.00

*Note. R^2=.66. *p<.05. ** p < .01.*

To investigate whether certain life experiences and perceptions of susceptibility predict beliefs about whether one would actually get the vaccine or not, separate regressions were run with each of the following variables as the predictor, and beliefs that one would actually get the HPV vaccine as the outcome: relationship status (single or in a relationship), Pap test status (ever had an abnormal test or not), vaginal intercourse status (have had or have not had), anal intercourse status (have had or not had), number of vaginal sexual partners, number of anal sexual partners, Susceptibility Scale Score, and relationship length. Three susceptibility variables were found to be predictive of participants' beliefs that they would actually get the vaccine: abnormal pap test status $F(1,145) = 4.51$, $p < .05$, adjusted R square $= .02$, relationship length $F(1,265) = 9.59$, $p < .01$, adjusted R square $= .03$, and having ever had anal intercourse $F(1,265) = 5.15$, $p < .05$, adjusted R square $= .02$. Those who had had an abnormal pap test ($\beta = -.17$, $p < .05$), and those who had ever had anal intercourse ($\beta = -.14$, $p < .05$) were less likely to think they would actually get the vaccine. Similar to other analyses, longer relationship length was associated with lower belief that one would actually get the vaccine ($\beta = -.19$, $p < .01$).

The Severity component variables were tested next. Participant scores on the General Severity Scale, the Treatment Severity Scale, the Social Severity Scale, and the Fear of Cervical Cancer scale were entered into the regression as possible predictors, with participants' belief that they would actually get the vaccine as the outcome variable. Only one of these variables, general perceptions of the severity of HPV, was found to be predictive $F(1,265) = 5.15$, $p < .05$, adjusted R square $= .02$. As perceptions of the

severity of HPV increased, thoughts that one would actually get the vaccine also

increased ($\beta = .15$, $p < .05$).

The predictive ability of the Benefit component variables were tested in one

regression. Scores on the Vaccine Positive Beliefs scale and the Vaccine Effectiveness

scale were entered as predictors of participants' beliefs they would actually get the

vaccine. Both variables were found to be predictive $F(2,262) = 85.87$, $p < .001$, adjusted

R square $= .39$. As beliefs about the effectiveness of the HPV vaccine ($\beta = .55$, $p < .01$)

and vaccine positive beliefs ($\beta = .14$, $p < .05$) increased, thoughts that one would actually

get the vaccine also increased.

To investigate which Barrier component variables were predictive of actual beliefs

that one would get the vaccine, one regression analysis was conducted using the

following predictor variables: Pharmaceutical Company Trust, Physician Trust, STI

Stigma and Shame, Fear of Doctor Stigma, Permissiveness subscale of the Sexual

Attitudes Scale, regular healthcare provider status, perceptions of the cost of the HPV

vaccine (HPV Vaccine Costs), and availability of insurance to cover costs. The model

was significant, $F(9,229) = 5.21$, $p < .001$, adjusted R square $= .14$. An examination of

standardized beta weights revealed that the following were significant predictors: HPV

Vaccine Safety Fears ($\beta = -.18$, $p < .01$), Pharmaceutical Company Trust ($\beta = .16$, $p <$

.05), and Physician Trust ($\beta = .19$, $p < .01$). Worry about stigma if asking a doctor for the

vaccine approached significance ($\beta = -.12$, $p = .064$), as did whether the vaccine was

covered by participants' insurance ($\beta = .12$, $p = .055$). As vaccine safety concerns and

fears about doctor stigma increase, thoughts that one would actually get the vaccine

decrease. As trust in pharmaceutical companies and physicians increase, thinking that one

would actually get the vaccine increases. And finally, having insurance increases thoughts that one would actually get the vaccine.

The remaining three components of the theoretical model being tested in this study, Cues to Action, Self-Efficacy, and Subjective Norms were, again, each tested with their own multiple regression analysis, each with one predictor variable: Positive Cues to Action for the Cues to Action regression, feelings of efficacy for the Self-Efficacy regression, and subjective social norms surrounding HPV vaccination for the Subjective Norms regression. The three regression analyses were significant: Cues to Action $F(1,246) = 142.50$, $p < .001$, adjusted R square $= .36$, Self-Efficacy $F(1,261) = 46.65$, $p < .001$, adjusted R square $= .15$, and Subjective Norms $F(1,265) = 97.75$, $p < .001$, adjusted R square $= .27$. As cues to obtain the vaccine ($\beta = .61$, $p < .001$), feelings of self-efficacy ($\beta = .39$, $p < .001$), and subjective norms ($\beta = .52$, $p < .001$) increase (become more positive), so do thoughts that one would actually get the vaccine.

Multiple regression of all significant predictors. All of the variables that were found to be significant predictors in these initial regressions, except for pap test normality status and number of anal intercourse partners, were then placed together into a final multiple regression model in order to determine which variables would still emerge as predictive of beliefs that one would actually get the HPV vaccine. Pap test normality status and number of anal intercourse partners could not be placed into the regression analysis because the number of individuals who never received an HPV vaccine shot and who had reported their pap test status or anal intercourse status was too small to be reliably used in the regression analysis. The final multiple regression model that was run, using the Enter method, was found to be predictive of participants' beliefs that they

would actually get the vaccine $F(10, 233) = 27.79$, $p < .001$, adjusted R square $= .52$.

Variables that were found to still significantly predict participants' desire for the HPV

vaccine were: Vaccine Effectiveness, Positive Cues to Action, Self-Efficacy, and

Subjective Social Norms. Results revealed that as beliefs about the effectiveness of the

HPV vaccine ($\beta = .31$, $p < .001$), positive cues to action ($\beta = .29$, $p < .001$), self-efficacy

($\beta = .10$, $p < .05$), and social norms encouraging the vaccine ($\beta = .17$, $p < .01$) increased,

so too did beliefs that one would actually get the HPV vaccine. See Table 8 for a

summary of these findings. To see a summary of the final significant predictors of all

three outcome measures please see Table 9.

Testing a Model of HPV Vaccination Intentions

While it is important to identify variables that have a direct effect on HPV

vaccination decisions, it is likely that more complex relationships exist between the

variables assessed in this study. In order to examine more complex relationships between

the study variables and HPV vaccination intentions, a model was tested through structural

equation modeling (SEM). The proposed model is displayed in Figure 1. Readers are

reminded that in SEM, squares indicate observed variables (a variable that has been

measured directly), while ovals represent latent variables (a construct that is inferred

based on multiple measured variables). As Figure 1 demonstrates, it is proposed that

vaccination intention decisions begin with an individual having a certain level of

knowledge about HPV, and with an individual receiving positive cues to action

(prompting to receive the vaccine). Knowledge and Cues to Action then affect

perceptions of HPV Severity, HPV Susceptibility, and HPV vaccine Subjective Norms.

Perceptions of Severity, Susceptibility, and Subjective Norms then impact

Table 8

Multiple Regression Results: Predictors of Beliefs Participants Would Actually get the HPV Vaccine (N = 244)

	B	SE B	β	sr^2
Constant	-.49	.65		
Severity General	0.07	0.09	.04	.00
HPV vaccine effectiveness	0.33	0.07	.31**	.05
Vaccine safety	-0.07	0.08	-.05	.00
Cues to action	0.15	0.03	.29**	.05
Vaccine Positive benefits	0.07	0.07	.05	.00
Pharmaceutical Trust	-0.10	0.10	-.05	.00
Physician Trust	0.07	0.06	.06	.00
Vaccination Efficacy	0.13	0.06	0.10*	.01
Subjective social norms	0.34	0.10	.17**	.02
Relationship Length	-0.00	0.00	-.07	.00

Note. R^2=.54. *p<.05. ** p < .01.

Table 9

Significant Regression Predictors for each of the Three Outcomes

Actual Vaccinations

Severity of Treatment

Vaccine Safety Concerns

Fear of Doctor Stigma

Insurance Coverage

Cues to Action

Desire to Obtain the Vaccine

Vaccine Effectiveness

Vaccine Positive Beliefs

Vaccine Safety Concerns

Cues to Action

Subjective Norms

Actually Think Will Get the Vaccine

Vaccine Effectiveness

Cues to Action

Self-Efficacy

Subjective Norms

individuals' assessments of HPV vaccination Benefits and Barriers. Because the Self-Efficacy measure used in this study measures participants' ability to overcome barriers to be vaccinated, it was predicted that Self-Efficacy would also impact assessment of Barriers. Finally, it was predicted that perceived Benefits and Barriers would impact desire to receive the vaccine.

Assessing the fit of a model tested by SEM is done through the use of fit indices. These indices provide information about the fit of the overall model, and because no one index is able to assess the accuracy of the model, various indices need to be examined. In order to assess fit in the current study the following fit indices were used: CFI, RMSEA, IFI, and SRMR. In order to demonstrate good model fit, CFI and IFI values should be over .90 (although the CFI value must also remain under 1.0). RMSEA values are said to represent good fit when the value is .05 or less. If the value is above .05 but below .10 the model is said to have adequate fit, and if the value is over .10 the model has bad fit. And finally, values of the SRMR index below .08 are considered to indicate good fit.

CFA Measurement Model

As recommended by Kline (2005), before a test of the proposed model could begin, it was necessary to perform a CFA analysis of the measurement model. This step was necessary because of the unvalidated nature of some of the measures used in this study, and the lack of prior research into the relationship between these measured variables and the latent variables they are anticipated to represent. The purpose of the CFA is to determine if the variables assessed in this study are indeed associated with the latent variables they are predicted to measure. Per Kline, in order to assess a CFA model, all latent variables are assumed to covary with each other, and thus their associations are

left unanalysed. Observed variables that did not serve to measure a latent variable but instead directly represent a component of the model (e.g., knowledge, self-efficacy) were also added into the CFA model and were allowed to covary with one another, and with the latent variables. Thus, all of the model components were free to covary. Per Kline, the variance of all of the latent variables was fixed to one for this analysis (Kline, 2005). Please see Figure 2 for a diagram of the original measurement model tested with CFA.

As the diagram illustrates, four variables were believed to assess perceptions of Susceptibility: The HPV Susceptibility Scale score, relationship length in years, number of vaginal sex partners, and a composite score developed from summing various life experiences that would impact participants' assessment that they were susceptible to HPV infection (e.g., ever having an abnormal pap, ever having an STI). Eight variables were believed to assess the latent Barriers variable: Comfort Talking with a Doctor, HPV Vaccine Safety Fears, the SAS Permissiveness subscale, the STI Stigma and Shame Scale, Trust in Pharmaceutical Companies Scale, Trust in Physicians Scale, Vaccine Costs, and Fear of Doctor Stigma (if asking for the vaccine). It was believed that two variables would assess perceived Benefits of the HPV vaccine: Vaccine Effectiveness and Vaccine Positive Beliefs. And finally, perceptions of General Severity, Treatment Severity, and Social Severity were thought to assess the Severity component of the model. In addition, four observed variables, each measuring a model component (Knowledge, Self Efficacy, Social Norms, Positive Cues to Action), were also included in the CFA model. Finally, participants' rating of their intention to receive the HPV vaccine was included as the final outcome variable in the model.

Figure 2:

Original CFA Measurement Model
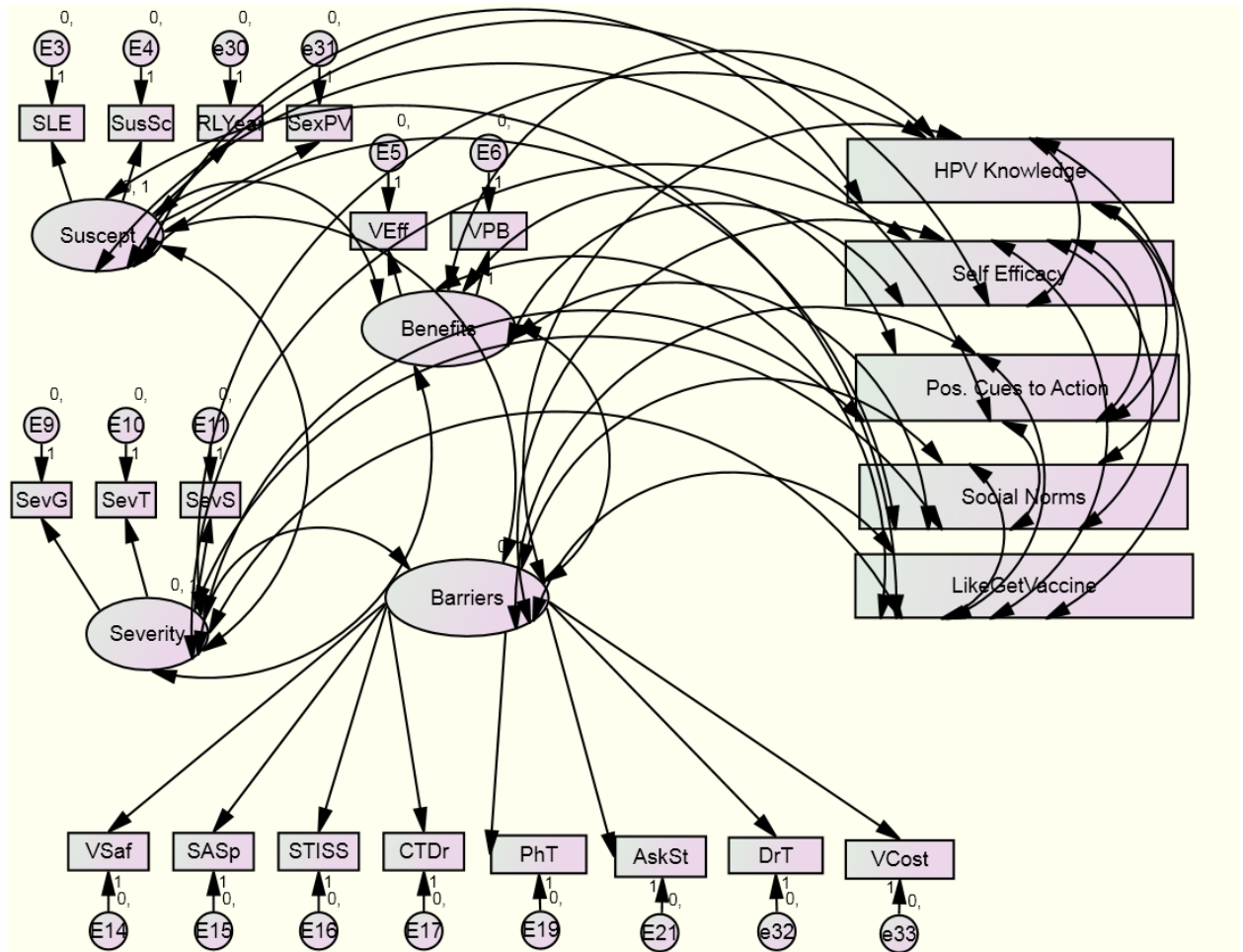
Figure 2. SLE = Susceptibility Score Based on Life Experiences. SusSc = Susceptibility Based on Life Experiences. RLYear = Relationship Length Years. SexPV = Number Sex Partners Vaginal Intercourse. VEff = Vaccine Effectiveness. VPB = Vaccine Positive Beliefs. SevG = Severity General. SevT = Severity Treatment. SevS = Severity Social. VSaf = Vaccine Safety Concern. SASp = Sexual Permissiveness. STISS = STI Stigma and Shame. CTDr = Comfort Talking to Dr. PhT = Pharmaceutical Company Trust. AskSt = Fear Doctor Stigma. DrT = Physician Trust. VCost = Vaccine Cost.

The results of the CFA indicated that the measurement model had reasonable-to-poor fit, χ^2(178, $N = 269$) = 553.36, $p < .001$; Goodness of fit indices: CFI = .735, RMSEA = .089 (CI = .080-.097), IFI = .745, SRMR = .099. In an effort to increase model fit, possible modifications were sought out. The first step was to examine variable normality. It was found that the variable Number of Vaginal Sex Partners departed from normality (kurtosis = 25.54), and so the decision was made to remove this variable from the model. Because the main focus of this analysis is to test the basic structure of the theoretical model being investigated, and because there are numerous other susceptibility variables that can be used in this analysis, the decision was made to drop this variable rather than to transform it. The next step was to examine model regression estimates. Four variables were found to be non-significant measures of the latent variables they were presumed to assess. These variables were: Relationship Length in Years, Vaccine Cost, Pharmaceutical Company Trust, and Physician Trust. It was decided that these four variables would also be removed from the model.

The second version of the CFA model was run and it had improved fit, χ^2(71, $N = 269$) = 214.32, $p < .001$.; Goodness of fit indices: CFI = .886, RMSEA = .073 (CI = .061-.086), IFI = .891, SRMR = .068. All CFA model regression weights were significant. Modification index recommendations were examined to determine if any changes to the model would improve model fit. No significant change recommendations were made. According to Kline (2005), a model can be said to have good fit if the RMSEA value is .05 or less. Any RMSEA value over .10 indicates a model with bad fit. Values in between these cut-offs are said to have reasonable fit. Kline also recommends that the lower and upper RMSEA confidence intervals be examined. Ideally, the lower CI value should fall

below .05 and the upper value should fall below .10. Because of the range of values included in the confidence intervals of this CFA model, it was decided that this measurement model had reasonable fit and would be used in the SEM analysis.

Structural Equation Model: HPV Vaccination Intentions

The next step to test the proposed model of HPV vaccination intentions was to take the measurement model that was assessed with the CFA analysis, and to add the paths indicating the proposed relationship directions between the model variables. Please see Figure 3 to view the full version of the model that was tested. When the model was tested, it was found to have reasonable-to-bad fit, $\chi^2(109, N = 269) = 394.46, p < .001.$; Goodness of fit indices: CFI = .743, RMSEA = .099 (CI = .088-.109), IFI = .750, SRMR = .108. In order to improve model fit, regression weights were examined to determine if any of the proposed model paths were non-significant. Three paths were found to be non-significant. The path leading from Cues to Action to Severity, the path leading from HPV Knowledge to Social Norms, and the path leading from Susceptibility to Benefits. These three paths were removed from the model. Regression modification indices also recommended the addition of a path from Positive Cues to Action to Benefits. Because it makes sense that receiving positive cues to get vaccinated would encourage women to think about the benefits of vaccination, the decision was made to add this path. This new version of the model was then tested.

The second version of the SEM model had improved, reasonable, fit, $\chi^2(111, N = 269) = 329.72, p < .001.$; Goodness of fit indices: CFI = .803, IFI = .808, RMSEA = .086 (CI = .075-.097), SRMR = .010. An examination of the model regression weights revealed that the path between perceptions of Severity and Benefits was no longer

Figure 3

Original SEM Model Tested
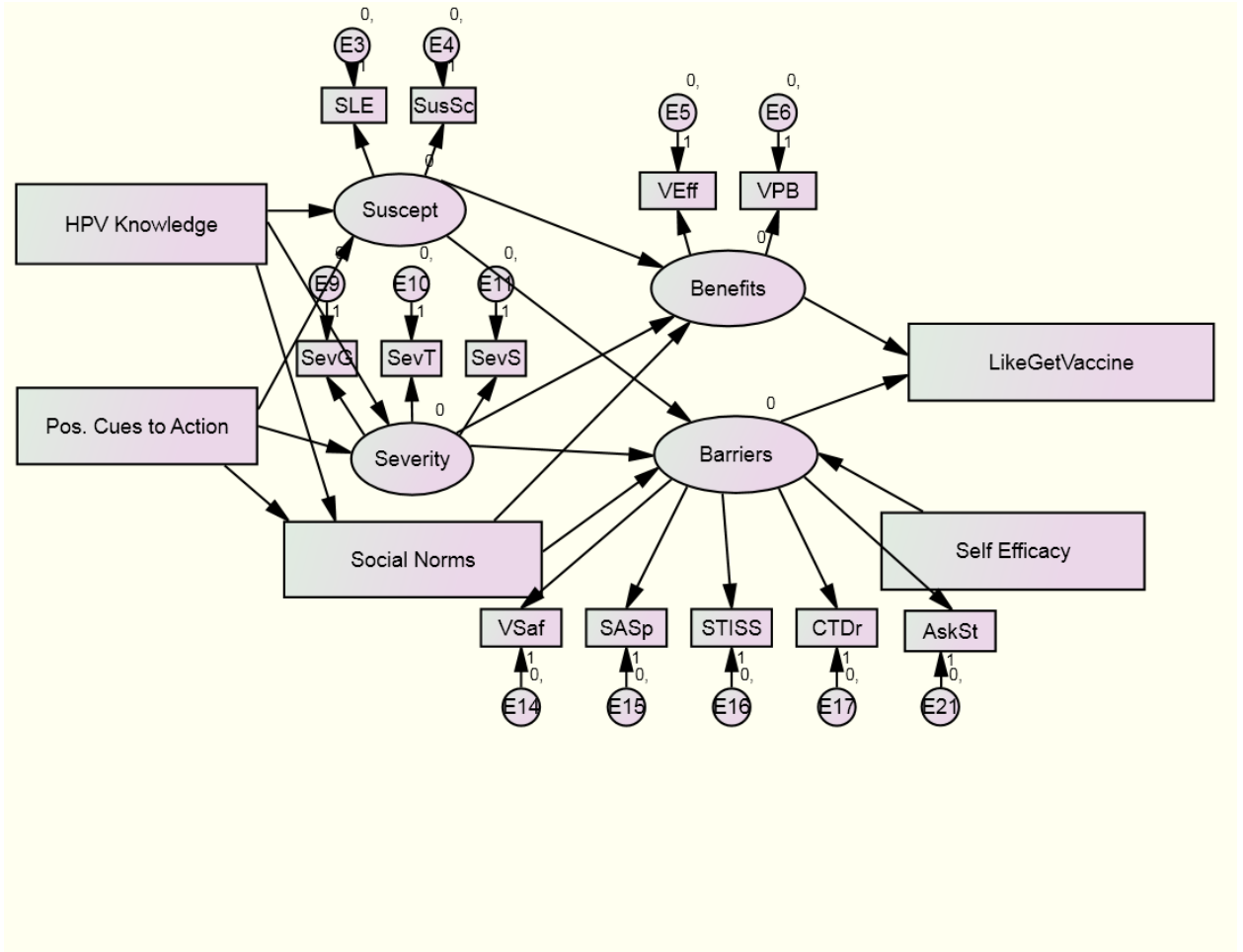
significant. Thus, the decision to remove this path from the model was made. An examination of modification indices for regression weights did not find any recommendations that would significantly improve the fit of the model. A rerunning of the model (model version 3) with the deletion of the path between Severity and Benefits found little change in the fit of the model. The model still had reasonable fit, χ^2(112, $N =$ 269) = 332.79, $p < .001$.; Goodness of fit indices: CFI = .802, IFI = .806, RMSEA = .086 (CI = .075-.096), SRMR = .101. An examination of the regression weights revealed that all paths were significant. A review of changes suggested by the modification indices showed that allowing the error terms of the Benefits latent variable and the Vaccine Safety Concern variable to covary would improve model fit. In SEM, error terms may need to be correlated for various reasons. These include the two variables assessing similar constructs, a variable missing from the model that if included would have effects on both variables, and finally, because of method bias such as socially desirable responding on both variables (Garson, 2012). Because it makes sense that these benefit and vaccine safety beliefs could have a mutual influence in common, these two error terms were allowed to covary. No other modification indices provided useful information for improving the model.

The fourth version of the model was run, and it was found that model fit did improve, χ^2(111, $N = 269$) = 296.87, $p < .001$.; Goodness of fit indices: CFI = .833, IFI = .837, RMSEA = .079 (CI = .068-.090), SRMR = .094. An examination of the model regression weights revealed that all paths were significant. Modification indices revealed three rational modifications that would improve model fit. Modification indices recommended that the Self Efficacy variable be allowed to covary with the error term of

three variables: Positive Cues to Action, Benefits, and Social Norms. Because it seems possible that these four variables may have a common influence that is not assessed in this model (e.g., Optimism, Trust), but which may impact all of these variables, the decision was made to allow these error terms to covary. These changes were made and the model was run again.

The fifth version of the model was found to have improved fit, $\chi^2(108, N = 269) = 232.38$, $p < .001$.; Goodness of fit indices: CFI = .888, IFI = .891, RMSEA = .066 (CI = .054-.077), SRMR = .069. All model regression weights were significant and no modification indices had suggestions for significant model improvement. In light of this, the decision was made to cease modifying the model, and to determine that this is the final version. Please see Figure 4 and Figure 5 for the final version of the model. Figure 5 contains only the model component variables so that standardized regression weights can be viewed.

Supplemental Analyses

Scale score mean differences between HPV vaccinators and non-vaccinators. To aid in the interpretation of the study results, mean outcome scale differences between those who received the vaccine and those who did not were investigated with t-tests (see Table 10). Results revealed that these two groups had significantly different average scores on the following variables: Treatment Severity, with those who obtained the vaccine believing that treatment would be more severe than those who did not get it; Vaccine Effectiveness, with those who obtained the vaccine believing the vaccine is more effective; Vaccine Positive Beliefs, with those who obtained the vaccine believing it is more positive than those who did not get it; Vaccine Safety Concerns, with those who
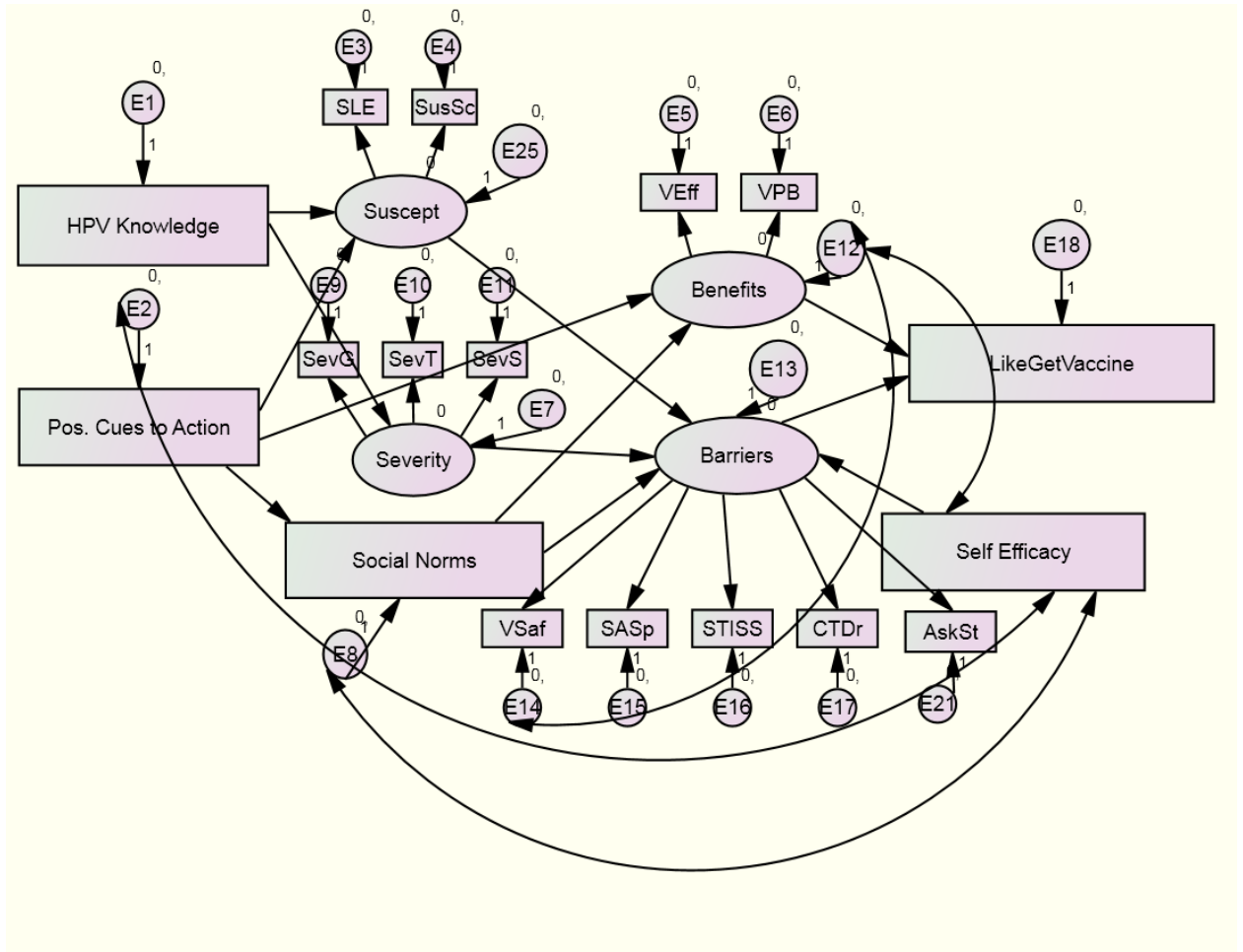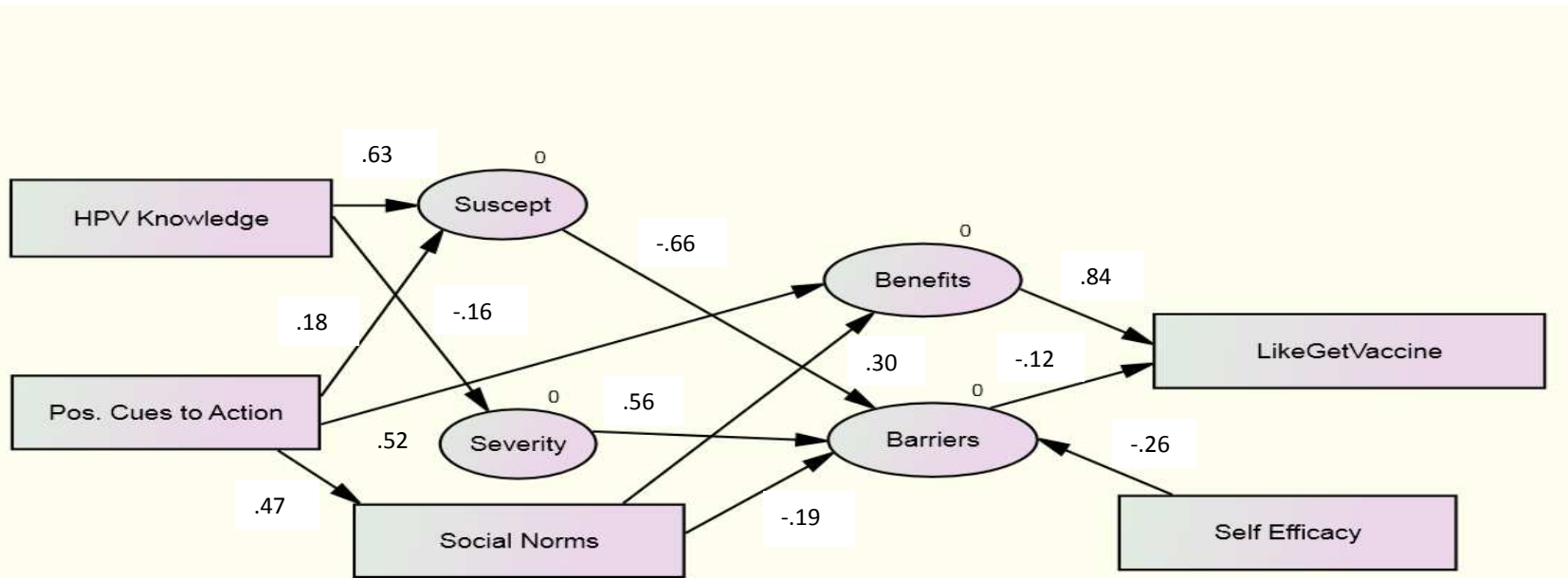
Figure 4

Final SEM Model

Figure 5

Final SEM Model Components with Standardized Regression Weights

Note. Model covariances and error terms are not shown in this depiction. All regressions are significant at at least .05.

Table 10

T-tests Comparing Outcome Scale Scores of Vaccinated and Unvaccinated Participants

Measure	Vaccinated		Unvaccinated			
	M	*SD*	*M*	*SD*	*t*	*p*
Susceptibility Scale	1.91	.84	1.87	.89	-.30	>.05
Severity General	4.47	.54	4.47	.57	.077	>.05
Severity Treatment	4.40	0.55	4.23	0.70	-2.37*	< .01
Severity Social	4.13	.88	4.03	.97	-.90	>.05
Fear of Cervical Cancer	3.59	.89	3.49	.95	-.85	>.05
Vaccine Effectiveness	4.07	0.76	3.10	1.01	9.91*	< .001
Vaccine Positive Beliefs	4.20	0.76	3.53	0.86	-6.82*	< .001
Vaccine Safety Concerns	2.70	0.85	3.63	0.78	9.98*	< .001
SAS Permissiveness	2.13	.76	1.98	.83	-1.55	>.05
STI Stigma and Shame	2.39	.80	2.43	.83	.43	>.05
Physician Trust	3.72	0.72	3.48	0.88	2.44*	< .05
Pharma. Company Trust	3.00	0.55	2.79	0.58	-3.22*	< .001
Cost Concern Scale	1.91	.98	2.19	1.27	2.13*	<.05
Fear Doctor Stigma	1.52	0.55	1.92	0.66	5.38*	< .001
Self-Efficacy	3.85	.91	3.52	.90	-1.69*	<.05
Social Norms	3.72	0.64	3.10	0.58	-8.50*	< .001
Positive Cues to Action	4.36	3.047	1.57	2.22	-8.14*	< .001

Note. *p < .05

obtained the vaccine believing it is more safe; Fear of Doctor Stigma, with those who

obtained the vaccine fearing stigma less than those who did not obtain the vaccine; Dr.

Trust, with those who obtained the vaccine having more trust in their physician;

Pharmaceutical Company Trust, with those who obtained the vaccine having more trust in

pharmaceutical companies; Cost, with those who obtained the vaccine having less

concern about cost than those who did not get the vaccine; Subjective Norms, with those

who obtained the vaccine reporting more positive norms for the vaccine than those who

did not get it; And Positive Cues to Action, with those who obtained the vaccine having

received more positive cues to action.

> **Physician sex and patient comfort.** Research on doctor-patient communication

has found that the gender of a doctor and patient can impact their communication. In light

of this, a linear regression was conducted in order to determine if the sex of participants'

doctors influenced their fear of experiencing stigma if asking for the vaccine. The

regression investigating this relationship was not significant, $F(1,329) = 0.81, p < .001$,

adjusted R square $ = -.001$, indicating that fears of stigma were not related to the gender

of the doctor. This lack of significance also held true when this possible relationship was

examined for just women who received the vaccine, and just those who had not received

the vaccine. An additional analysis was then conducted to determine whether health care

provider gender influenced participants' level of comfort in talking with their health care

provider in general. The regression investigating this relationship was significant,

$F(1,329) = 22.61, p < .001$, adjusted R square $ = .062$. With individuals feeling more

comfortable with female doctors ($M = 3.88, SD = .93$) than male doctors ($M = 3.35, SD = $

1.06).

Recommending the HPV vaccine to male and female friends and family members. In addition to the main outcome items used in this study, participants were also asked some additional outcome items that were not a main focus of the current investigation. Two of these items examined whether participants would recommend the HPV vaccine to their male or female friends and family members. Responses to each question were recorded on a 5-point scale that ranged from 1 (definitely would not) to 5 (definitely would). A t-test to investigate whether participants would make different recommendations for male and female friends was significant, $t(370) = 8.47$, $p < .001$. Participants were more likely to recommend that their female friends and relatives get the vaccine (M = 3.24, SD = 1.39) than they were to recommend their male friends and relatives to get it (M = 2.79, SD = 1.35). Additional analyses also revealed that participants' vaccination status was related to whether they would recommend the vaccine to female friends or family members, $F (3,367) = 28.80$, p < .001, and to male friends or family members, $F (3,364) = 15.89$, p < .001. Post hoc tests revealed that participants who had received two or three of the vaccine shots were more likely to recommend vaccination to their female friends and family members than were individuals who had not had any vaccinations. For males, those who had had three shots were more likely to recommend the vaccine than those who had no shots.

Chapter IV

Discussion

When girls and women obtain the HPV vaccine they are protecting themselves against a virus that can lead to cancerous cells and genital warts, and all of the negative psychological and social implications that these illnesses can have for them. A vaccine for HPV was first released in 2006, and while many studies that had investigated anticipated obtainment of the vaccine reported that it would most likely be obtained by the majority of the targeted population, actual vaccination rates have not reached anticipated levels, especially for girls and women who are not eligible for the school-based vaccination program. There are many possible factors that could explain why girls and women choose to obtain the vaccine or not. This study used a modified version of the Health Belief Model to examine the relationship between psychosocial variables and HPV vaccination in a sample of women residing in Canada. Direct relationships between the study variables and actual and anticipated HPV vaccinations were investigated through logistic and multiple regression. While past research has examined the direct relationships between many of the components/variables used in this study and HPV vaccinations, many of the model's components have not been sufficiently researched to date. Some variables have received little attention in the research literature or have not been measured adequately (e.g, perceived susceptibility, self-efficacy, cues to action), while the effects of others have been found to be inconsistent (e.g., knowledge, perceived severity). Another model component, perceived barriers, has repeatedly been found to be predictive of vaccine related outcomes, but due to the large number of factors that can be classified as potential barriers, additional novel barriers to HPV vaccination had yet to be

investigated (e.g., medical establishment variables, sexuality variables). This study attempted to remedy some of these shortcomings.

In addition to analyses investigating direct effects, in order to investigate more complex relationships, a modified Health Belief model of HPV vaccination intentions was tested using Structural Equation Modeling. Few studies in this area have tested complex models of health behaviour. In addition, those that have explored the match between health behaviour change theories and HPV vaccinations have not used structural equation modeling to test possible models. Instead, these studies have used regression analysis, which limits the types of relationships between the model variables that can be explored. This study is novel in that the complex interrelationships between the model components were tested with SEM, providing a clear and complex picture of the decision making process as it related to HPV vaccination intentions.

This discussion describes the major findings of this study, beginning with an examination of vaccination and health behaviour rates. Next, support or lack of support for the study hypotheses are described, so that a clear picture of the usefulness of each model component can be determined. After this, a discussion of the results organized by type of outcome (actual vaccinations, desire to get vaccinated, and actual thoughts on whether one would obtain the vaccine) can be found. Finally, as the last step in describing the results of this study, a discussion of the model that was tested was undertaken. Following the various descriptions of the study results, a discussion of practical implications, limitations, and recommendations for future research is presented.

Vaccination and Health Behaviour Rates

Not surprisingly, this study found that the majority of participants had not received the HPV vaccine, with 72% of participants reporting they never received it, and 27% of the sample reporting they had received at least one shot. While studies conducted prior to the release of the vaccine reported that high proportions of young women believed they would obtain it, uptake rates after its release were lower than anticipated, especially in non-school-based settings. The results found in the current study are in line with rates found in other studies that were conducted after the release of the vaccine. For example, Caskey, Lindau and Alexander (2009) found that 30% of 13 to 17 year olds, and 9% of 18 to 26 year olds had received the HPV vaccine. As these rates demonstrate, vaccination rates after the release of the vaccine were lower than anticipated, and have stayed low over time.

In order to assess participants' sexual risk taking and sexual health behaviours, the women in this study were asked to provide information such as their age of first intercourse, the number of sexual partners they had, their STI status, and whether they had ever had a pap test. When asked about their sexual experiences, 84% of study participants reported that they had engaged in some form of sexual activity. When vaginal intercourse was investigated specifically, it was found that 73% of the women in this study had had vaginal intercourse, that the average number of sexual partners the women had had was four, and that the average age of first intercourse was 17 years old. When anal intercourse was investigated, it was found that almost 20% of the women had engaged in it, with the average age of first experience being higher than for vaginal intercourse, at 19 and a half years. Individuals also reported having fewer anal intercourse

partners, with the average being 1.39. These values correspond roughly to Canadian

sexual experience statistics, although the women in this study appear to engage in sexual

intercourse a year later than the national average. Nationally, the average age of first

vaginal intercourse is 16.5 years (Rotermann, 2005), and 86% of youth have had sex by

the age of 24 (Rotterman, 2012). The difference in age of first intercourse may be related

to the educated sample used in this study, or may be due to regional differences, as a large

proportion of this sample came from Ontario. Ontario youth seem to be slightly less

sexually experienced compared to national averages, with fewer Ontario youth engaging

in sex than the Canadian average (Rotermann, 2005).

To date, Pap testing has been the most effective preventative action that a woman

can take to avoid cervical cancer. This study found that 60% of the women who

participated had ever received a Pap test. While this number at first seems low, further

examination found that almost 80% of women who had had sexual intercourse had

received a Pap test. Because physicians may not recommend Pap tests to women who

have not yet engaged in sexual intercourse, these statistics are not surprising. For

example, in a national health survey it was found that 77% of heterosexual Canadian

women report having had a Pap test within the last three years (Tjepkema, 2008). As

these results indicate, then, the women involved in this study were proactive about

protecting their gynecological health through the traditional method of Pap testing.

Participants were asked to indicate if they had ever had an abnormal Pap test, and almost

13% of the sample had had an abnormal test. This rate is slightly higher than national

abnormality rates, as 8% of Pap tests done in Canada require follow-up due to

abnormality (The Canadian Women's Health Network, 2007). This difference may be a

reflection of the age range of the study participants (younger women are more likely to have abnormal Pap tests), or it may be due to self-selection bias, as young women who have experienced an abnormal Pap may have been more interested in participating in this study.

The women in this study were also asked if they had ever had an STI. Results indicated that 4.5% of the sample had had an STI, and 3.7% of the sample had been told they have HPV. This is similar to rates of common STI diagnoses in the general Canadian population. For example, 4.3% of 15-29 year olds have had Chlamydia. Because HPV is a non-reportable STI, exact national rates are not available. However, given its prevalence, it is likely that symptomatic HPV rates in the Canadian population are similar or higher than those for Chlamydia. This suggests that the current study does not have an overrepresentation of women diagnosed with HPV.

Overall, the HPV vaccination rates and sexual experiences reported in this study closely reflect those of women in the Canadian population. Because of this, the results of this study are likely to reflect the experiences of Canadian women from an educated background.

Discussion of Regression Results Organized By Hypotheses

Hypothesis 1: Perceived susceptibility to HPV infection will predict HPV vaccination. It was predicted that feeling susceptible to HPV would predict HPV vaccinations. When actual vaccine obtainment was investigated, two susceptibility variables were initially found to be predictive: relationship length in years, and whether an individual had ever had vaginal intercourse. As relationship length increased, participants were less likely to get the vaccine, and women who had never had sexual

intercourse were less likely to be vaccinated. These results coincide with results found in previous research, which found that individuals in monogamous relationships, and individuals who had never had sexual intercourse, were less likely to want the HPV vaccine (Buchanan, 2008; Caskey, Lindau & Alexander, 2009; Marshall, Ryan, Roberton, & Baghurst, 2007). From the perspective of women, the finding that those who have not had intercourse are less likely to obtain the HPV vaccine makes sense. These individuals likely believe they are not at risk of acquiring an STI, and thus they do not believe they need to be vaccinated. Unfortunately, this is the group of women for whom the vaccine is most protective. While the initial regression investigating the susceptibility variables and actual vaccine obtainment found a significant relationship, when the susceptibility variables were entered into the regression investigating all significant predictors of actual obtainment, they were found to no longer be predictive. Thus, while a relationship exists, it appears to be small, with other variables accounting for actual obtainment decisions.

For women who had never been vaccinated, belief in susceptibility to HPV infection influenced desires to get vaccinated. Susceptibility scale scores and relationship length predicted desires. Women who felt more susceptible to infection were more likely to desire the vaccine, while the longer a woman was in a relationship, the less likely she was to desire it. As noted in the literature review section of this document, few studies have used a measure to assess actual feelings of susceptibility to HPV infection. The finding here, that a desire to get the vaccine is related to feelings of susceptibility, is one of the only studies (see Kuitto, Pickel, Neumann, Jahn & Metelmann, 2010, for another example) that shows that actual feelings of susceptibility (as assessed with a measure and not inferred based on demographic data such as relationship status) can be related to a

desire to be vaccinated. When the significant susceptibility variables discussed here were placed into the regression with other significant predictors of a desire to get the vaccine, it was found that they were no longer significant. Thus, while a small relationship might exist, again, other variables such as perceptions of vaccine effectiveness, positive cues to action and subjective norms have been found to be more predictive of desire to be vaccinated.

Finally, when women who had never been vaccinated were asked if they actually thought they would get the vaccine, regardless of whether they wanted it or not, it was found that abnormal pap test status, relationship length, and ever having anal intercourse were predictive of beliefs that one would actually get the vaccine. Similar to the other regression findings, the longer a woman was in a relationship, the less likely she was to think she would actually get the vaccine. Surprisingly however, women who had had an abnormal pap test in the past, or who had ever had anal intercourse, were less likely to think they would actually get the vaccine. These findings were surprising because previous research has found that women who have engaged in more sexual risk taking, such as having multiple sex partners (more than 5 partners versus 1-5), or having ever had an STI, were more likely to want to be vaccinated (Jones & Cook, 2008). Previous research has also found that women who had had an abnormal pap test in the past were more likely to want the HPV vaccine after an educational intervention than were women who had not had an abnormal Pap test (Ferris, Waller, Owen & Smith, 2008). Seemingly incongruous findings as they relate to risk and health behaviours are not completely unheard of in the health care field, however. For instance, research has shown that some women who are at risk for breast cancer are less likely to be screened for it, and that this

lack of screening behaviour is related to anxiety about finding a problem (Rimer, McBride & Crump, 2001).

The reason for the surprising findings in this study may relate to how this particular question was worded. In the current study, number of anal intercourse partners and abnormal Pap test status were not found to be predictive of *desire* to get the vaccine. It is this type of intention (desire) that past research has investigated. Asking women if they actually think they would get the vaccine (regardless of whether they want it or not) may activate a more complex thought process. While a woman may recognize that she wants the vaccine, certain factors, such as knowledge of her Pap history and sexual risk-taking/experience, may influence her perception of her HPV infection likelihood and thus her thoughts on vaccination. For example, women who have had an abnormal pap test may believe that they already have HPV, and thus they may decide that given the likelihood that they have HPV (high) they are less inclined to overcome barriers (e.g., time, cost) to actually get the vaccine, even though they may want it. It could also be that women who think they have already been exposed to HPV believe they are immune to it, or may not be aware that they can contract other strains of the virus. Thus, they do not realize that they would benefit from the vaccine. Similar to the previous two outcomes, however, when these susceptibility variables were entered into the regression with other significant predictors, they were no longer predictive, again indicating a weak relationship between susceptibility and the outcome.

In conclusion, while it initially appears that susceptibility variables do influence actual and anticipated vaccinations, in interesting ways, it becomes clear with further analyses that susceptibility variables, when considered in the context of other predictors,

are not strong predictors of any of the HPV vaccine outcomes. Other factors play a much greater role in directly predicting vaccination behaviour.

Hypothesis 2: Perceived severity of HPV infection will predict HPV vaccination. Hypothesis two stated that participants' perceptions of the severity of HPV would influence vaccinations, with the likelihood of wanting or obtaining the vaccine increasing as perceptions of severity increased. Various types of severity were assessed in this study: perceptions of the severity of treatment, of the social impact of having HPV, of HPV in general, and of fears of cervical cancer. Only perceptions of the severity of treatment were found to influence whether a woman got the vaccine or not. Women who were more concerned about treatment were more likely to want to get the vaccine. Concern about treatment severity proved to be a strong predictor of women's actual vaccination decisions, as it maintained its predictive ability when all significant predictors of vaccine obtainment were placed into the final regression equation.

For those who had not yet received the vaccine, severity was not found to be predictive of a desire to get the vaccine, although concerns about general severity were found to be related to actually thinking one would want the vaccine. This relationship was small, however, and when other factors that influence women's vaccination decisions were taken into account, concerns about severity no longer had an impact on whether women would think they would get the vaccine or not.

The results of this analysis parallel what has been found in previous research: mixed support for the influence that severity has on HPV vaccination decisions. Interestingly, previous research that has investigated whether severity is predictive of *intentions* to vaccinate also did not find a relationship (Buchanan, 2008; Dempsey, Zimet,

Davis & Koutsky, 2006; Jones & Cook, 2008). Thus, the lack of strong significant findings of a relationship between perceptions of severity and intentions in this study is not necessarily surprising. The interesting finding here, however, is that treatment severity was found to be predictive of actual vaccination behaviours.

Hypothesis 3: Perceived benefits will predict HPV vaccination. It was hypothesized that the more benefits an individual believed the HPV vaccine would provide, the more likely they would be to get vaccinated or to intend to get vaccinated. It was found that both beliefs about vaccine effectiveness and vaccine positive beliefs predicted actual vaccine obtainment when they were placed in the regression alone with vaccination status as the outcome. However, when they were entered into the regression model with other significant predictors, they were no longer predictive.

The benefit variables proved to be more predictive of intentions to vaccinate. When desire to obtain the vaccine and beliefs that one would actually get the vaccine were assessed, both benefit variables were found to be predictive of each of these intentions. When placed into regressions with other significant predictors, the benefit variables were still predictive. Both vaccine effectiveness and vaccine positive beliefs continued to be predictive of a desire to get the vaccine, while beliefs about vaccine effectiveness continued to predict beliefs that one would actually get the vaccine. These results are similar to those of previous research, which found that perceived benefits predicted intentions (Buchanan, 2008). These previous studies also had found that women's beliefs that the vaccine would help themselves or their children (similar to vaccine effectiveness in this study), or their community or society (similar to vaccine

positive beliefs in this study) were predictive of intentions (Dempsey et al., 2006; Gudmundsdottir et al, 2003).

In summary then, it appears that beliefs about the benefits of vaccination are strong predictors of intentions to vaccinate, and yet are not the strongest predictors of actual vaccination behaviours. While little previous research in the area of HPV vaccinations has investigated these two benefit variables, this study suggests that these are important variables to consider when trying to understand what factors may influence women to think about obtaining the vaccine.

Hypothesis 4: Perceived barriers will predict HPV vaccinations. It was predicted that more perceived barriers would negatively impact HPV vaccination behaviours. A large number of barrier variables were used in this study, and thus it was not surprising that for each outcome assessed, some barrier variables were predictive while some were not.

When actual vaccine uptake was investigated, it was found that concerns about the safety of the HPV vaccine, women's fears of experiencing stigma from their health care provider, and insurance coverage significantly impacted actual uptake. These variables maintained their significance when entered into regressions with other variables, indicating that various barriers do play an important role in predicting actual vaccine uptake.

When a desire to get the HPV vaccine was investigated, concerns about vaccine safety, trust in pharmaceutical companies, cost, and fear of experiencing stigma from a doctor were associated with women's desires to get vaccinated in initial analyses.

However, when other significant predictors were also taken into account, only vaccine safety concerns had a large enough influence on desire to maintain its significance.

A similar lack of significance in the final regression model for barrier variables was also found when participants' thoughts that they would actually get the vaccine were assessed. In the final regression investigating what barriers would influence whether women thought they would actually get the vaccine, no barrier variables proved to be predictive.

In summary, then, women's concerns about the safety of vaccines, their fears of experiencing stigma from their doctor, and whether they had insurance, were the barriers that maintained their predictive ability for at least one of the outcomes. Interestingly, fears of experiencing stigma if asking a physician for the vaccine was one of the novel variables that was investigated in this study. This finding indicates that the STI status of the vaccine may influence women's decisions to vaccinate. Scale means revealed that while both vaccinated and unvaccinated women on average do not believe that their physicians would make negative judgements about them, women who got the vaccine disagreed more strongly that their doctor would judge them negatively. While the idea that patients do not want their doctors to view them negatively is not a new one in medical research, with medical research showing that patients give socially desirable information to their doctors because of concern with creating a desirable impression, fearing a loss of control, or even to avoid a lecture (Bilney & D' Ardenne, 2001; Dew et al., 2007; Lewis, Matheson & Brimacombe, 2011), the fact that vaccination uptake is impacted by a fear of stigma from doctors is a unique finding in the area of HPV vaccination research. Even though the strength of the relationship between the fear of

stigma and vaccine uptake in this study was small, it will still be interesting to investigate this construct further in future research. It may be that fears of stigma are not as salient in questionnaire research, and that more complex experiments to investigate its effects in actual social interaction settings is needed. In summary, the finding that concerns about stigma may impact vaccination decisions is an important one to consider when experts look at ways to increase vaccinations, as some women may have concerns that they will be viewed negatively by others for asking for or obtaining this vaccine. Fear of stigma will also be an important variable to investigate in future STI vaccine studies, as other STI vaccines are currently in development.

When the discussion turns to the other two barriers that were strong predictors of uptake, cost and concern about safety, their impact on vaccine obtainment was less surprising. Many media sources have documented (and fueled) public concern about the safety of the HPV vaccine, and about vaccines in general. In addition, past research into vaccination decisions, both about vaccines in general and the HPV vaccine specifically, have found that concerns about safety were related to uptake (Kahn et al., 2008; Prislin, Dyer, Blakely & Johnson, 1998). In this study, safety concern was one of the variables that had the largest difference in average scores when t-tests investigated differences between those who obtained the vaccine and those who didn't. Those who obtained the vaccine had an average score of 2.7 out of 5 on the concern scale, while those who did not get vaccinated had an average score of 3.63 out of 5, revealing that those who did not obtain the vaccine actually reported that they did worry about the safety of the vaccine, while those who did get it reported a more neutral position.

Past research has consistently found that cost is a factor that individuals consider when thinking about the HPV vaccine (Caskey, Lindau & Alexander, 2009; Kahn et al., 2008; Sauvageau, Duval, Cilca, Lavoie & Ouakki, 2007). Because of this it is not surprising that the insurance variable was found to be predictive of actual vaccination behaviours. It may be that those who have to pay for the vaccine simply could not afford it, or they may not have felt that they needed the vaccine enough to pay for it when it is rather expensive. Interestingly, the cost scale itself was not predictive of vaccination decisions in the final regression analyses This finding may be a true one, although the scale used in this study was not validated in other research, and so this finding could also be related to measurement error. The results from this study however, found that on average, participants reported that they were a little concerned about cost when they completed the cost scale; however, other variables such as benefits, cues to action and subjective norms proved to be more predictive of actual or intended vaccination decisions.

Hypothesis 5: Knowledge will predict HPV vaccinations. HPV Knowledge was hypothesized to predict HPV vaccine obtainment and intentions. Surprisingly, knowledge was not directly related to any of the outcomes, neither actual nor intended vaccinations, assessed through the regressions conducted in this study. Previous research found mixed results when investigating the predictive ability of this variable, and thus while unexpected, the lack of support for this hypothesis is not entirely out of line with the findings from previous studies (Buchanan, 2008; Dempsey et al., 2006). While this study did not find that knowledge directly impacted vaccination related outcomes, knowledge did act upon other model variables, so that while it did not directly predict HPV vaccine

decisions and intentions, it was still indirectly related to these outcomes. Further elaboration of this result appears in the discussion of the structural equation model tested for this study that appears later in this section. In terms of the original hypothesis though, no support for the hypothesis was found.

Hypothesis 6: Self-efficacy will predict HPV vaccination. It was theorized that feelings of self-efficacy for obtaining the vaccine would be related to *intentions* to vaccinate. Participants who had already received the vaccine were not asked to complete the items assessing self-efficacy, and so relationships between efficacy and actual vaccination decisions were not investigated. It was found that women with higher feelings of self-efficacy to obtain the vaccine were more likely to believe that they would actually get the HPV vaccine. This relationship between feelings of efficacy and thoughts that one would get the vaccine was significant, both in the individual regression investigating the relationship, and when it was placed in the final regression with other significant predictors. Feelings of self-efficacy were also initially predictive of desires to get the vaccine, although this relationship become nonsignificant when other, more predictive variables, were added into the analysis. Buchanan (2008) and Kahn et al. (2008) also found that self-efficacy predicted intentions to vaccinate.

Hypothesis 7: Cues to Action will predict HPV vaccinations. It was anticipated that Cues to Action would be related to HPV vaccination behaviours. The results of this study revealed that Positive Cues to Action were indeed a strong predictor of actual vaccine obtainment, desire to get the vaccine, and thoughts that one would actually get the vaccine. Urgings to get the vaccine were predictive of each of these outcomes when assessed in initial regressions, and also when placed into regression equations with all

significant predictors, thus, revealing strong support for this hypothesis. While past research has found that cues from physicians and families do predict vaccinations (Caskey, Lindau and Alexander, 2009; Dempsey et al., 2006), the present study shows that cues from other sources also have a positive influence on vaccination behaviours. In this study, the number of cues an individual received, and their type, served as the cues variable. Cues could come from sources such as family, doctors, friends, advertisements, and romantic partners. Findings indicated that the more people or sources who talk to or educate women about the HPV vaccine, the more likely one is to be vaccinated, or to want the vaccine.

Hypothesis 8: Subjective Norms will predict HPV vaccinations. Subjective norms were hypothesized to predict HPV vaccination behaviours and intentions. Women's perceptions of the social norms surrounding the vaccine were found to predict actual vaccine obtainment when assessed apart from other significant predictors (although not when assessed with others), and to strongly predict both desire to get the vaccine, and thoughts that one would actually get it. This significance held true for both outcomes when norm scores were entered into the regressions that included other significant predictors, indicating that what others think about the vaccine does influence women's decisions. This supports findings by Buchanan (2008), who found that the subjective norms component of the Theory of Planned Behaviour was the only component from this model that was found to be predictive of intentions in her study. This idea, that the social discourse and norms surrounding certain vaccines influences uptake is not a new one, and has been discussed in research for other types of vaccines as well. For an interesting and

timely discussion of how public perceptions influence vaccination decisions (and in particular vaccine confidence), see Larson, Cooper, Eskola, Katz & Ratzan (2011).

Because subjective norms were so predictive of desire and thoughts that one would actually want the vaccine, reasons for why norms were not predictive of actual vaccination behaviours were investigated further. Questionnaire items used to measure this construct were examined, and it appeared that these items may not have been worded adequately to assess this construct for individuals who had already received the vaccine. More specifically, the response options were not worded appropriately. An example item was "My romantic partner thinks…" and example response options were: "I definitely should not get the HPV vaccine", and "Maybe I should get the HPV vaccine". Because the wording of the items implies that a vaccination decision has not yet been made, individuals who had already been vaccinated may have been confused by this wording. If the items had been worded differently, the findings for this variable as they relate to actual vaccination behaviours may be more reliable. Future research in this area should aim to measure this variable more appropriately.

Regression hypotheses overview. While many of the study variables were significant in initial regressions that only looked at the relationship between outcomes and each component, and the variable(s) that measured it, when all significant predictor variables from the various components were placed together into final regressions to assess each outcome, some variables lost their significance. Two of the modified Health Belief model components were not found to be directly predictive of any outcomes after the final regressions were conducted. These two components were perceived susceptibility and knowledge. Only one model component, cues to action, was predictive

of all three outcomes. The remaining model components were predictive of one or two outcomes. In summary, then, the majority of the hypotheses that predicted relationships between the model components and study outcomes were supported. However, specific hypothesis support varied across different outcome variables. In order to better understand the variables and model components that were predictive of different outcomes, a summary and discussion of the direct predictors of each outcome is presented next.

Predictors of Actual Vaccinations

Because this research is one of the few studies that has investigated factors that are related to actual vaccinations, the findings in this section may be particularly useful to health professionals. The model components that significantly predicted actual vaccine obtainment were: Severity (the severity of treatment variable), Barriers (vaccine safety concerns, fear of doctor stigma, insurance), and Cues to Action (positive cues to action). Fear of the severity of HPV treatment and cues to vaccinate are likely the factors that encourage women to get vaccinated, while the barrier variables discourage uptake.

What do these significant findings mean? While many barrier variables were hypothesized to predict actual vaccine uptake, only three were found to do so. Given past research findings that have reported concerns about the safety of the HPV vaccine, and given some individuals' concern about vaccine safety in general, the fact that concerns about safety was one of the significant predictors of obtainment was not surprising. In addition, many past studies have found that cost is associated with HPV vaccination uptake, and so the significance of the insurance variable was also highly anticipated.

Perhaps the most interesting finding in terms of significant barrier variables, is the finding that women's fears of experiencing stigma from a doctor was predictive of uptake. This is a novel variable in HPV vaccine research, and to this authors knowledge, is investigated here for the first time. Even though the statistical analyses from this study revealed that this variable had only a small impact on the outcomes, this finding is still important because it provides new information about a barrier to HPV vaccinations that health professionals need to recognize and research further. With this new knowledge, healthcare professionals can know to act to reassure their patients that obtaining the vaccine is a smart and healthy choice, and that they will not be negatively judged for doing so. Interestingly, given the relationship between Fear of Doctor Stigma and vaccine uptake in the current study, it is rather surprising that STI Stigma and Shame scores were not predictive of actual vaccination behaviours. This may be an interesting avenue for future research.

While the hypothesis that perceived severity would predict uptake was supported, it is interesting that only one type of severity, treatment severity, was significantly related to behaviours. Treatment severity items asked participants how upset they would be if they had to receive treatment for certain medical issues associated with HPV. This is in contrast to other severity items, which intuitively may seem more likely to be predictive of behaviours (for example, items asking participants if they would be upset if they were told they have HPV, or genital warts, or abnormal cervical cells). It may be that pondering the actuality of treatment for an illness, which includes physical discomfort, time commitments, and social interactions, versus an illness in the abstract, is more powerful than pondering the severity of illness in general.

Finally, a surprising finding when looking at predictors of vaccine uptake, was the lack of a significant relationship between any of the benefit variables and vaccine obtainment. It appears that positive thoughts about the vaccine do little to directly impact actual vaccinations. While individuals' own positive beliefs about the vaccine may not be a strong enough motivator to push them to get the vaccine, encouragement from others to get the vaccine (cues) was. This study shows that a mix of social (positive cues to action) and negative (perceptions of treatment severity) factors most strongly influence vaccination decisions.

Predictors of Desire to Get Vaccinated, and Thoughts That One Will Actually Get It

While predictors of actual vaccine obtainment may be regarded as the most important variables to identify when it comes to investigating HPV vaccinations, it is also important to understand factors that predict intentions to vaccinate in those who have previously decided to forgo the vaccine. Interventions can and should target these individuals, especially considering the large number of women who fit into this category. Thus, understanding factors that will make these women consider getting vaccinated is important.

For participants who had never been vaccinated, the variables that were found to be predictive of the two types of intentions were generally similar, although there were some differences. The model components that were predictive of a desire to get the vaccine were: Benefits (Vaccine effectiveness, Vaccine Positive Beliefs), Barriers (Vaccine Safety Concerns), Cues to Action, and Subjective Norms. Model components that were predictive of thoughts that one would actually get vaccinated were: Benefits (Vaccine effectiveness), Cues to Action, Self-Efficacy, and Subjective Norms.

One of the most surprising findings here, is that barriers were not strongly related to either outcome. Only one barrier, concern about the safety of the vaccine, was predictive of desires, and no barriers were predictive of thoughts that one would actually get the vaccine. In contrast, three barriers were found to predict actual vaccine obtainment.

Subjective norms were found to influence both desires to get the vaccine, and thoughts that one would actually get it, indicating that women's thoughts about the vaccine were influenced by what they perceived to be the social norms surrounding this issue. In light of this, it will be important that intervention efforts in this area focus on increasing societal acceptance of the HPV vaccine. This could be accomplished by means such as encouraging dating partners to both get vaccinated, or encouraging friends, or parents and children, to talk about the vaccine together. The more sources that women receive encouragement from, the more likely they will be to get vaccinated.

The perceived benefits associated with vaccination were also found to be predictive of both intention outcomes. This is not surprising, and was predicted. It is logical that individuals who perceive benefits to vaccination will want to be vaccinated, and are more likely to think they actually will do so. It is interesting to note that benefit variables were initially found to be predictive of actual vaccination decisions, but that their predictive influence was not as large as the influence of other variables. For individuals who have not been vaccinated, however, perceived benefits are still a strong motivating factor to wanting the vaccine.

Feelings of self-efficacy related to getting the HPV vaccine were found to predict beliefs that one would actually get vaccinated, but not desires to get it. Self-efficacy items

asked participants if they were confident that they could get the vaccine in light of things like cost, time, and potential barriers. This finding demonstrates that individuals who report that they are not likely to actually get the vaccine are aware that they lack the ability to overcome some of the barriers to obtainment that were listed in the efficacy questionnaire. This finding also highlights that researchers need to carefully word their outcome items when doing research, to ensure that items really ask what it is that researchers want to know. While desires to get the vaccine and thoughts that one actually will do so are closely related constructs, and do share many of the same predictors, there are some interesting differences between the two variables.

Why Predictors May Vary for Actual and Intended Outcomes

One of the interesting questions that the results of this study raises, is why the variables that influence actual vaccination behaviours and intentions to vaccinate differ. These differences are likely related to barriers. While forming an intention to do something does not require one to become keenly aware of, and overcome barriers, acting or not acting requires one to acknowledge, think about, and then overcome obstacles (or not). This idea is clearly demonstrated by the current study finding that more barrier variables were predictive of actual vaccination behaviours then they were of intentions.

Discussion of the Model of HPV Vaccination Intentions

The proposed model explaining the process through which HPV vaccination desires are formed, was found to have good fit to the data after a small number of modifications. In the original model, the decision process is depicted as beginning with the components HPV Knowledge and Cues to Action. It was hypothesized that the decision process begins with knowledge about the topic, and also when one is prompted

to think about the topic at hand (in this case HPV vaccinations). These two components were both hypothesized to influence perceptions of Severity, Susceptibility, and Subjective Norms. These hypothesized relationships were supported for the most part, although some relationships were not present. Knowledge was not found to influence Subjective Norms, and Positive Cues to Action were not found to influence perceptions of Severity. In addition, an unanticipated relationship between Cues to Action and the Benefits variable was discovered. A discussion of each component and the relationships between them follows.

For the Knowledge component, the results of the SEM confirmed that knowledge does influence how susceptible one feels to HPV and how severe one believes HPV is. Knowledge does not influence social norms, however. It was anticipated that HPV knowledge may impact social norms, because increased knowledge would allow one to be more aware and critical of the perceptions of others. This hypothesis was not supported, however.

Examination of the relationships that were found, or not found, between positive cues to action and the three components believed to be influenced by them, revealed that cues to obtain the vaccine were related to women's perceptions of their susceptibility to HPV. Prompts to obtain the vaccine were also found to be related to subjective norms, but were not found to be related to perceptions of severity. The lack of a relationship between Cues and Severity could be explained by the idea that receiving Cues does not necessarily mean that one understands HPV and the impact it can have on health. Receiving prompts to obtain the vaccine did appear to influence individuals' feelings of susceptibility though, and they also made participants aware of the social norms surrounding the

vaccine. Positive Cues to Action was also, unexpectedly, found to be related to perceived benefits. This unanticipated relationship does make sense however, as the more positive cues one receives for the vaccine, the more likely they would be to perceive the benefits of vaccination.

When looking at the original model that was proposed, the next set of anticipated relationships involved the components of Susceptibility, Severity, and Subjective Norms. These components were each hypothesized to be related to perceived benefits and barriers. Results revealed that the social norms surrounding the vaccine are related to women's perceptions of both the benefits and the barriers of vaccination. Women's perceptions of HPV severity and their susceptibility to HPV infection were both found to be related to perceived barriers to vaccination, but they were not found to be related to perceived benefits. The lack of a relationship between feelings of susceptibility and severity, and the perceived benefits of vaccination was surprising. It was anticipated that women with more worry (higher perceived severity and susceptibility), would believe there were more benefits to obtaining the vaccine because vaccination would lessen their worries. Instead, it appears that the potentially negative feelings of severity and susceptibility are related only to women's perceptions of HPV vaccination barriers. It may be that once women's thoughts about the unpleasant topics of HPV severity and susceptibility are activated, that they begin to worry about other negative things such as fears of vaccine safety, fear of stigma, and costs.

Returning to the proposed model tested for this study, a relationship between feelings of self-efficacy and women's perceptions of the barriers surrounding vaccination was predicted. This relationship was supported by the results of this study, an important

finding because it shows that participants may have the potential to overcome barriers that they believe stand in their way to vaccination. Due to the way that self-efficacy was assessed in this study, with items measuring women's feelings that they could overcome various real-world obstacles (time, money) to getting vaccinated, it was not anticipated that feelings of self-efficacy would impact any other theoretical component.

The final set of predictions made in the original model were that Benefits and Barriers would be related to desires to obtain the HPV vaccine. These predictions were supported in this study. Both components were found to be significantly related to the outcome. Interestingly, perceived benefits had a much stronger relationship with vaccine desires than did perceived barriers. This finding falls in line with the results of the regression analyses conducted earlier. While both types of benefits predicted desires to obtain the vaccine in the regressions, only one of many barriers proved to be predictive.

While the model tested in this study had good fit with the data, the women that make up the study sample represent a privileged group of women, with the majority of women having at least some university education and being Caucasian. It may be that if this model was tested on a less privileged group of women, minority, poor or uneducated women for example, that some of the component relationships would change. Underprivileged women face life challenges and develop perspectives about the world that privileged women do not necessarily develop. For example, underprivileged women often have lower levels of educational obtainment, which may impact how the knowledge component of the model would influence the study variables. In addition, these women would likely face more or stronger barriers to vaccination uptake. Cost may prove to be a much more important predictor of decisions for this group of women, as may fears of

stigma, or distrust of physicians or the healthcare system. Disadvantaged groups typically have experienced more stigma, and have less faith in healthcare and the altruism of healthcare professionals, and thus these factors may have an impact on what a model of HPV vaccine intentions looks like for these women. Of course, other model components and variables may also be impacted as well. Infection and treatment may be deemed more severe due to a lack of resources to deal with it, or women may feel more susceptible for example. The complex interactions between the variables may change in interesting ways when the model is tested on other groups of women. Thus, future research should seek to test the current model of HPV vaccine intentions, as well as alternate models, with other groups of women.

In summary, the model of desires to obtain the HPV vaccine that was proposed in this study was supported with a few modifications. These modifications were all logical, and provide a deeper, and perhaps more interesting, understanding of the relationships between the model components. In addition, while the results of the regression analyses presented earlier seemed to suggest that certain model components are not related to HPV vaccine outcomes, the SEM model reveals that all components are important to the decision making process. Not all components are directly related to the outcomes, but they do impact other components. Because no previously published research in the area of HPV vaccinations has tested a SEM model of decision making, this study provides an important starting place from which to research the decision making process related to actual and intended HPV vaccination decisions.

Limitations

As is true for all research, there were limitations to the current study that warrant discussion. While a substantial number of women participated in this study, a larger sample size would have allowed for a better analysis of the impact of some of the study variables on outcomes. More specifically, demographic or personal history variables that were only reported by a small number of participants (e.g., HPV status, HPV treatment), could not be analysed for their impact on the outcome variables. A larger sample size might have allowed for this. In addition, the sample for this study was predominantly white and college educated, and a more diverse sample would have been more representative of women in general. The final issue related to sample is the age of the women recruited for this study. While it is important to investigate predictors of vaccinations in women 18 to 30, it would also be very beneficial to conduct a study with younger girls and their parents.

Another limitation of the current study concerns some of the study measures. Because this investigation was based on a theoretical model that had not been extensively tested in this area, various study measures had to be created or modified. As a result, obtaining or creating alternative measures for some of the variables in this study may result in additional significant findings. An example of a measure in need of modification is the Subjective Norm measure. The items were not worded well for women who had already received the vaccine. Thus, analyses using this measure for this population may be less reliable in the current study. Research in the area of HPV vaccinations should continue to modify and evaluate the appropriateness of measures in order to confirm the findings found in this study.

A related idea that also needs to be considered when contemplating the findings from this research, is the retrospective nature of the study, in that predictors of actual vaccinations were assessed after vaccination were or were not obtained. It may be that individuals who obtained the vaccine have different views and perceptions, as a result of having obtained the vaccine, than they did before they obtained it. Future research should address this limitation by assessing attitudes before an individual has obtained the vaccine, and then comparing the views of those who were vaccinated and not vaccinated.

Another aspect of the present study that some may consider to be a limitation, is the method used to recruit participants. Participants were recruited from two sources and completed the study online. The majority of the sample came from the Psychology Department participant pool. The participant pool is comprised of Introductory Psychology students, as well as individuals in various other psychology courses at the university. A large proportion of University of Windsor students take Introductory Psychology; thus, the students within the participant pool come from a variety of backgrounds and likely represent a diversified group of women within the university setting. In light of this, while using a participant pool may be a limitation, the diversity of the group makes it less of a concern then it may be otherwise. The second group of women who participated in this study were recruited through email and the social networking site Facebook. Because the email and Facebook recruitment advertisements originated with the author, the women who participated in this study and who heard about it through this method may be limited, in that they might constitute a more homogeneous group of women with some degree of connection to the researcher or her acquaintances. While the types of recruitment used in this study is a limitation, the examination of the

sample characteristics and the comparison made to an average Canadian sample revealed that in many respects this sample is similar to the average Canadian woman.

Another possible limitation with this study is the fact that data was collected online. However, in this age of high computer usage, 79% of Canadian households have the internet (Statistics Canada, 2010), and especially among the age demographic recruited for this study, it is not anticipated that having to use a computer to complete the study would lead to problems with the integrity of the data collected. Thus, collecting data online likely had minimal impact on the external validity of the study.

Implications

The results of this study have several important practical implications. This study clearly highlights the fact that previous research findings based on only the analysis of direct relationships between variables and HPV outcomes do not provide an accurate picture of all of the factors that influence vaccination decisions. Thus, it is important for health professionals and researchers who are designing interventions and educational programs related to HPV vaccinations to understand the complex range of variables that may have both direct and indirect relationships with HPV vaccination decisions. For instance, the regression results from this study might seem to suggest that HPV knowledge is not related to vaccine outcomes, and thus may lead to the erroneous conclusion that increasing knowledge will not have an effect on HPV vaccine outcomes. However, the results of the model testing in this study clearly show that knowledge does have an impact on outcomes indirectly, through its relationship to perceptions of severity and susceptibility, and thus educational efforts in this area would still be important.

Another interesting implication that arises from the current study is related to the finding that concern about experiencing stigma from a health care provider if asking for the vaccine can impact vaccination decisions. This is an important finding, and should be taken into account by health professionals when they are offering women the vaccine. Professionals should plan an approach to offering the vaccine that indicates to women that they will not be judged negatively for accepting it. An intervention in this area would be an interesting next step. For example, a study investigating whether an intervention designed to decrease women's fears of stigma increases vaccine acceptance could be conducted. Information could be provided through various methods in order to assess which is most effective. For example, a face to face discussion with a health care provider, an online program recommended by a reliable source, or printed educational materials provided by the healthcare provider or their support staff to patients. It should be noted that research into the usefulness of a Canada-based sexual health related website found that using the internet as a sexual health promotion tool is very effective, in that websites can have far reach, be cost-effective, and can be tailored so that they are interactive and engaging (Barak & Fisher, 2003). In addition to interventions targeted at the public, training could also be offered to health care providers so that they learn how to interact with patients in a way that makes women feel safe and free from stigma.

This study also revealed that concerns about vaccine safety do play a role in HPV vaccination decisions. Efforts to reduce vaccine concerns at both the individual level (e.g., when women are visiting with their health care providers), and at the societal level (e.g., through government and public health campaigns) are needed.

Finally, another important implication of the current study was the finding that positive cues to action do influence vaccinations. Thus, the more types of positive cues that a woman receives, the more likely it is that she will be vaccinated. Positive public service messages, commercials, encouragement from doctors, and efforts to have women encourage each other, should be developed and investigated in order to encourage vaccine uptake.

Suggestions for Future Research

One of the most important tasks for future research in this area is to focus on developing and validating scales to assess the model components and variables that were investigated in this study. While some variables were assessed with previously validated scales, others were not, and this inability to use well researched measures may have impacted the results of the current study. Thus, researchers looking at HPV vaccinations should focus on identifying variables that may have an impact on vaccine decisions, and how to measure them most effectively.

One of the more novel findings from this study is that women's fear of stigma when asking for the vaccine can impact their vaccination decisions. Future research into possible interventions related to this would be valuable. Training health professionals to be aware of this barrier and how to overcome it in their discussions and education with women, and evaluating the impact of such training efforts, would be an interesting avenue of research.

Finally, future research in this area should also move away from the analysis of only direct relationships among variables and outcomes, and should begin to focus more on complex modeling. Because there were no previous SEM studies investigating HPV

vaccination decisions to my knowledge, the model tested in this study was exploratory. Additional research involving complex modeling is needed in this area, so that alternative models can be tested and compared. This will be the only way that a full understanding of the factors that influence vaccinations will be available. Continuing research in this area has the potential to positively impact women's lives by increasing vaccinations. This might lead to fewer HPV infections, less distress from symptoms, and saved lives.

Conclusion

This study investigated factors that predict actual and anticipated HPV vaccinations. Results revealed that the predictors of actual vaccine obtainment were women's perception of the severity of HPV treatment, concerns about vaccine safety, whether one had insurance coverage for the vaccine or not, level of fear of experiencing stigma from their doctor, and positive cues to action. Factors that have an impact on intentions to receive the HPV vaccine were participants' belief that vaccines are beneficial, beliefs that the HPV vaccine would be effective, concerns about vaccine safety, positive cues to action, self-efficacy, and social norms surrounding the vaccine. This study was beneficial to the area of HPV vaccine research, not just because it identified direct predictors of vaccination decisions, but also because it revealed that these predictors are different for actual versus intended vaccination decisions, and that even predictors of certain types of intentions vary somewhat, as desires to get the vaccine had some different predictors than did actually thinking one will get the vaccine. Finally, this study was also beneficial because it tested and found support for a complex model of HPV vaccination intentions and is the first study to use theory to successfully build and find support for a model of HPV vaccination intentions using SEM.

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Appendix

Questionnaires Developed for This Study

Perceived HPV Susceptibility

Rated on a five-point scale: 1 (very unlikely) 2 (somewhat unlikely) 3 (50/50 chance) 4 (somewhat likely) 5 (very likely)

1. Do you feel at risk of being infected with HPV?
2. Do you feel at risk of getting cervical cancer?
3. Do you feel at risk of getting genital warts?
4. Do you feel at risk of having an abnormal Pap test?

Perceived Severity of HPV Infection

Rated on a five-point scale: 1 (not at all) 2 (a little) 3 (somewhat) 4 (quite a bit) 5 (very much)

General Severity Questions

1. How upset would you be if / were you when you were told that you have the HPV virus?
2. How upset would you be if / were you when you were told that your Pap test was abnormal?
3. How upset would you be if / where you when you were told that you have genital warts?
4. Would you / did you worry about the impact of an HPV infection on your body?
5. Would you / did you worry about your future fertility if you had HPV?

Treatment Severity Questions

1. How upset would you be / were you if you had to have treatment to remove genital warts?
2. How upset would you be / were you if you had to have treatment to remove abnormal cervical cells?
3. How upset would you be / were you when thinking about the impact of HPV on your body?
4. Do you believe treatment for genital warts is/ was painful?
5. Do you believe treatment for abnormal cervical cells is/was painful?

Social Severity Questions

1. How upset would you be / were you if your doctor knew you had HPV?
2. How upset would you be / were you if your sexual partner knew you had HPV?
3. How upset would you be / were you if your friends knew you had HPV?
4. How upset would you be / were you if you had to tell future sexual partners that you had HPV?
5. If you were single and dating would you worry / did you worry about telling future sexual partners that you had HPV?

HPV Vaccine Effectiveness

Rated on a five-point scale: 1 (not at all) 2 (a little) 3 (somewhat) 4 (quite a bit) 5 (very much)

1. In general, how effective do you think the HPV vaccine is?
2. In general, I believe the HPV vaccine would benefit me.
3. I believe the HPV vaccine would benefit me because it would reduce my risk of HPV infection.
4. I believe the HPV vaccine would benefit me because it would reduce my risk of Genital Warts
5. I believe the HPV vaccine would benefit me because it would reduce my risk of developing cancer.
6. I believe the HPV vaccine would benefit me because it would protect my future fertility
7. I believe the HPV vaccine would benefit my current or future romantic relationship(s)
8. I believe the HPV vaccine would benefit my current or future sexual relationship(s)

HPV Vaccine Safety Fears

Rated on a five-point scale: 1(strongly disagree) 2 (disagree) 3 (neutral) 4 (agree) 5 (strongly agree)

1. I worry about the safety of the HPV vaccine
2. I worry the HPV vaccine has not been out long enough to properly judge its safety.
3. I worry about side effects from the HPV vaccine
4. I worry about the safety of vaccines in general
5. I worry about side effects from any type of vaccine
6. I believe vaccines are safe.

Fear of Dr. Stigma

Rated on a five-point scale: 1(strongly disagree) 2 (disagree) 3 (neither agree nor disagree) 4 (agree) 5 (strongly agree)

If I asked my doctor for the HPV vaccine, the doctor would think…:
1. That I sleep around
2. That I am responsible
3. That I will cheat on my romantic partner
4. That I have poor morals
5. That I don't trust my romantic partner
6. That I am protecting myself
7. That my relationship is on the rocks
8. That I am loose
9. Nothing of it (*removed before analysis)
10. That I want to protect my sexual partner(s) (*removed before analysis)
11. That I am smart
12. That I am a bad person

Pharmaceutical Company Trust

Rated on a five-point scale: 1(strongly disagree) 2 (disagree) 3 (neutral) 4 (agree) 5 (strongly agree)

1. I trust pharmaceutical companies
2. The only thing pharmaceutical companies care about are profits
3. I feel like I have to do my own research about whether certain drugs or vaccines are safe.
4. Pharmaceutical companies properly test their drugs before they are made available to the general public.
5. The people who work for pharmaceutical companies are honest people.
6. I worry that pharmaceutical companies do not tell the truth about all of the side effects and reactions that people have to their products.
7. Pharmaceutical companies charge significantly more for their products than they need to make a reasonable profit.
8. Pharmaceutical companies bribe doctors to recommend their products.
9. Developing and testing new drugs and vaccines is a long and complex process and pharmaceutical companies do the best they can to make the process safe and fair.
10. Pharmaceutical companies make false claims in their advertising

Cost

Rated on a five-point scale: 1(not at all) 2 (a little) 3 (somewhat) 4 (quite a bit) 5 (very much)

1. Is/was cost a concern when you think about/thought about getting the HPV vaccine?

2. Is the HPV vaccine a fair price?
3. Does/did the cost of the HPV vaccine influence your decision to get the vaccine?
4. Can you/could you afford to get the HPV vaccine?

VITA AUCTORIS

Name: Kristin Audra Saunders

Place of Birth: Newcastle, New Brunswick, Canada

Year of Birth: 1981

Education: Bachelor of Arts (Honours), Psychology
                 University of New Brunswick, 2003

                 Masters of Arts, Applied Social Psychology
                 University of Windsor, 2006

                 Doctor of Philosophy, Applied Social Psychology
                 University of Windsor, 2012