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Bridging the gap: Using the theory of planned behavior to predict HPV vaccination intentions in men

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BRIDGING THE GAP: USING THE THEORY OF PLANNED BEHAVIOR TO PREDICT HPV VACCINATION INTENTIONS IN MEN

A thesis submitted in partial fulfillment of the requirement of the degree of Master of Science at Virginia Commonwealth University

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Abstract

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Genital human papillomavirus (HPV) is the most common sexually transmitted infection (STI) in the US, with an estimated incidence rate of 6.2 million new cases each year. Men have higher instances of certain HPV related outcomes (e.g., head/neck cancers) when compared to women, so male vaccination with the HPV vaccine is also paramount to preventing cancer. The present study examined the theory of planned behavior (TPB) as a model for predicting HPV vaccination intentions among men. Results suggest the TPB was a well-fitting model to the data, but not all aspects of the TPB model were predictive of HPV vaccination intentions. Behavioral beliefs (e.g.., the belief that vaccination will provide a beneficial outcome) were the only significant predictor of HPV vaccination intention in the next 6 months. Perceived norms, motivations to comply with norms, attitudes towards the HPV vaccine, and self-efficacy were not significant predictors of HPV vaccination intentions.

Bridging the gap: Using the theory of planned behavior to predict HPV vaccination intentions in men

Genital human papillomavirus (HPV) is the most common sexually transmitted infection (STI; CDC, 2011a), with an incidence rate of approximately 6.2 million new cases each year in the United States (Weinstock et al., 2004). HPV is part of the papillomaviridae family of viruses, which affect all parts of the body. For instance, HPV type 1 affects the soles of the feet primarily. Over 100 strains of HPV have been identified, with around 40 causing warts (Koutsky & Kiviat, 1999). In general, HPV is a virus that replicates deep within the epidermis, creating small tumors called “papillomas”. Certain strains are more of a public health concern than others, as HPV strains 6 and 11 cause 90% of genital warts, while strains 16 and 18 can cause cervical, anal, penile, oropharyngeal, and head/neck cancers (Markowitz et al., 2009; CDC, 2011b; Pisani et al., 1997; Koutsky, 1997; Kreimer et al., 2005). HPV does not cause immediate symptoms (CDC, 2011a), and as such can go unnoticed until more serious symptoms (genital warts and/or cancer) become apparent (CDC, 2011a).

High-risk strains of HPV can be transmitted sexually, and condoms may not be very effective in preventing HPV infection (Schiffman & Kjaer, 2003). HPV can be transmitted through vaginal, anal and oral sex, as well as genital to genital contact (CDC, 2009). High-risk strains (e.g., HPV strains 16 and 18) are found in 99% of cervical cancers (Bosch & de Sanjose, 2003). Genital HPV infection may cause other forms of cancers, as it has been linked with breast cancer (Antonsson et al., 2011) and lung cancer (Li et al., 2011). It is estimated that at least 50% of sexually active individuals have contracted one or more strains of HPV at some point in their lives (CDC, 2011b).

HPV is estimated to account for about 5% of all cancers world-wide (Parkin, 2006). The National Cancer Institute (NCI) estimates that 12,170 new cases of cervical cancer arise each year, with around 4,220 associated deaths (NCI, 2012a). There are an estimated 5,820 new cases of anal cancer each year, with an estimated death rate of 770 persons per year (NCI, 2011a). Penile cancer has an incidence rate of 1,570 new cases each year, and a death rate of 310 persons per year (NCI, 2012b). Finally, oropharangeal cancers (laryngeal and pharyngeal) have a larger public health impact, with incidence rates estimated at 26,320 new cases yearly and an estimated death rate of 5,990 individuals yearly (NCI, 2011b). These cancers have all been related to HPV infection from strains 16 and 18, which underscore the importance of HPV prevention through vaccination.

There is no approved test for HPV status in the United States for either men or women (CDC, 2011b). This does not mean that HPV cannot be detected, it only illustrates that the CDC and FDA have not come to a conclusion on an appropriate test for overall HPV infection. Women's health checks routinely require a Babeș-Papanicolaou (pap) test, by which a trained professional inspects the cervix and takes a sample of the cells inside the cervix (Womenshealth.gov, 2009). Pap tests in women simply screen for abnormal cells on the cervix (Womenshealth.gov, 2009), which are primarily caused by HPV (CDC, 2011b). This provides an indirect test for HPV, but cannot causally attribute any abnormal cells to HPV infection. Pap tests may also not detect HPV infection, as pap tests tend to sample from the top layer of the cervix, and might not detect lower viral load infections in the basal layer of the skin (Trotteir et al., 2010). For men, there is not a comparable indirect test for HPV infection. There are generally two methods employed by biological studies that assess HPV infection: seroprevalence through antibody detection (Dunne et al., 2006), and Polymerase Chain Reaction (PCR) tests to detect the presence of the HPV virus itself (Dunne et al., 2006). These studies provide important information about factors associated with HPV infection.

Seroprevalence studies show that women tend to have higher antibodies for HPV strains 6, 11, 16, and 18 when tested for HPV (Carter et al., 2001; Eisemann et al., 1996; Slavinsky et al., 2001; Strickler et al., 1999; Svare et al., 1997; Stone et al., 2002; Thompson et al., 2004; Kreimer et al., 2004). While not as high as their female counterparts, men also have relatively high rates of HPV. A review by Dunne and colleagues (2006) illustrated that HPV prevalence in men ranges from 20% to as high as 72.9% while the range for women is 14% to 90%. These studies illustrate how highly variable HPV infection is, and this can be attributed to HPV not being a permanent affliction. This variability could potentially be due to the variability in testing for men and women, as well as the inefficiency of those testing methods (Trottier et al., 2010). As HPV is an area specific infection much like the herpes-simplex virus, it is often overlooked that men need multiple area sampling (e.g., the glans of the penis, the anus, the mouth, the central sulcus) to detect actual HPV infection. Many cross-sectional studies that assess HPV infection test men from one infection site (e.g., the glans of the penis), which can severely underestimate prevalence rates among men (Giuliano et al., 2007).

HPV infections may clear from the body within a few years for those with healthy immune systems (CDC, 2011a). Similar to common influenza and sinus infections, HPV may eventually go away without treatment (CDC, 2011b). This assertion is not without contention. HPV is still a relatively “new” virus in the research literature, and testing for HPV is still inefficient (Trottier et al., 2010). Even with the highly sensitive PCR testing available, it has been suggested that HPV may also be a latent virus (Trottier et al., 2010). A latent virus lies dormant within a cell and can begin reproducing at any time, typically when the immune system is weakened. Trottier and colleagues (2010) warn that HPV viral load may fall below that which is detectable by seroprevalence tests. This may make it appear that HPV is cleared from the body, while it may just be that the virus has gone dormant and, therefore, undetectable. Research supports the former hypothesis that HPV can be cleared completely from the body. Trottier and colleagues (2010) followed women over time, testing for HPV infection and measuring sexual behavior. Results of this study showed that women can be re-infected by the same strain of HPV over time, and the chief proximal factor to the infection was having a new sexual partner, and potentially being re-exposed to HPV. Furthermore, the viral loads for re-infection with the same HPV strains were similar at both time points, suggesting that natural immunity after initial infection did not diminish the viral burden in succeeding infections later in life (Trottier et al., 2010). If the latent virus hypothesis were true, it would be unlikely that a new sexual partner would potentially "re-activate" the virus, and viral loads for reactivation should not be similar to initial infection viral loads. As stated earlier, immune changes would be a more plausible trigger for reactivation if HPV were a latent virus.

This potentially runs contrary to how the immune system is seen to work. Cell-mediated immunity should produce memory cells that will respond to the same strain of a pathogen if the body becomes re-infected. This long held belief might not be entirely correct; the immune system may react differently to chronic vs. acute viral infections. Wheery and colleagues (2004) showed that immune T cells that respond to chronic viral infections do not gain the same memory capabilities as do T cells that respond to acute viral infections. Wherry and colleagues (2004) suggest that "prolonged exposure to antigen without any rest results in cells that are "addicted " to antigen and cannot persist without it" (p.16008). Antigen independent cells do not develop as a result of infection, which creates poor recall of responsiveness, no homeostatic proliferation, and poor antigen-independent persistence when one is re-infected. This can explain why people lose immunity to chronic viruses, and potentially explains why HPV can be re-acquired multiple times. The Gardasil vaccine produces antigen independent memory cells, and therefore potentially provides lifetime immunity against HPV strains 6, 11, 16, and 18 once the 3 shot Gardasil series is completed.

HPV can be transmitted in many ways that are not isolated to transmission through blood contact, and condoms only offer partial protection for the sexual transmission of HPV (Schiffman & Kjaer, 2003). Even if a condom is worn, HPV can infect areas around the penis that are not covered by a condom (CDC, 2011a). HPV can survive outside the body for a period of days and maintain high infectivity (Roden et al., 1997), leaving the potential risk for infection from non-sexual contact. In fact, oral HPV transmission may be quite common because of this. Prevention of HPV is essential considering the contagiousness of the virus. The cancer risk from HPV is likely due to consistent re-infection of high-risk strains (e.g., strains 16 or 18; Bendik et al., 2011; Marek et al., 2011). What potentially occurs over the course of an individual’s lifetime is that they comes in contact with the same, or different, high-risk strains of HPV and potentially develop HPV-related cancers as an outcome.

As the cancer risk associated with HPV infection is clear, the FDA approved a quadrivalent vaccine (Gardasil) produced by Merck & co., Inc. to provide immunological protection from HPV strains 6, 11, 16 and 18 in persons 9 through 26 years old on June 8, 2006 (FDA, 2010; FDA, 2006). Cervarix is an additional vaccine that has been approved to prevent HPV. Cervarix protects against two cancer-causing strains of HPV (strains 16 and 18). This vaccine is only marketed for girls between the ages of 9 to 25 (FDA, 2011).

HPV Vaccine Efficacy.

Vaccines are an excellent strategy for reducing, and potentially eradicating, infectious diseases (Andre et al., 2008). On October 21, 2009, the Advisory Committee on Immunization Practices (ACIP) provided a passive recommendation for males between the ages of 9 and 26 to be vaccinated with the quadrivalent HPV vaccine Gardasil, but suggested that the vaccine not be part of routine vaccinations for men (CDC, 2010b). The intent of male vaccination, according to the CDC, is to prevent genital warts and subsequent female infection (CDC, 2010b). The Gardasil vaccine is taken in a 3 shot series, after the initial dose, the vaccinated individual is asked to return 2 months later for a second dose, and again for a third dose 6 months from the initial first dose date (Merck, 2011). Vaccination with Gardasil should start early, before an individual sexually contracts HPV (CDC, 2011b). While ideal to be vaccinated younger, the vaccine is still suggested for individuals up to ages 26 (CDC, 2011b). As stated earlier, the virus is cleared in about 2 years in healthy adults (CDC, 2011b). Owing to this, it is still considered to be effective to become vaccinated with Gardasil after sexual intercourse has been initiated (CDC, 2011b). The Gardasil vaccine has been shown to be effective in men, and it can reduce more than 90% of genital warts, as well as greater than 90% of persistent complications, including cancers, that are caused by HPV types 6, 11, 16, and 18 (Giuliano & Palefsky, 2008).

Gardasil has been shown to be an effective vaccine for prevention of HPV viruses 6, 11, 16, and 18 (Giuliano, Palefsky, & Goldstone et al., 2011). Studies have illustrated the overall effectiveness of Gardasil as well as its effectiveness in men (Giuliano, Palefsky, & Goldstone et al., 2011). Long-term effectiveness is currently unknown, but research suggests lifetime immunity as a result of full vaccination with Gardasil (CDC, 2011d).

Harm rates associated with Gardasil are relatively low. Harm rates are defined as any harmful event that occurs after a Gardasil vaccine is administered. There are two general classifications of harm, those that are non-serious (e.g., headache, nausea, fainting after injection) and those that are serious (e.g., death, permanent disability, life-threatening illness). These reports are tracked through the Vaccine Adverse Effects Reporting System (VAERS) and reviewed by both the FDA and the CDC. These reports are not limited to complications immediately following vaccination, but encompass any negative consequence perceived by the individual to be causally attributed to the vaccine administered at any time after the vaccine was received. From 2006 to December 2008, 23 million individuals were vaccinated with Gardasil (CDC, 2011c). Of those 23 million, 12,424 individuals reported side effects to VAERS, of which 94% were considered non-serious (CDC, 2011c). The remaining 772 cases (6% of total reports) consisted of serious side effects, including 32 deaths (CDC, 2011c). The deaths reported to VAERS were all explained by factors unrelated to vaccination, suggesting that they were not causally related to receiving the Gardasil vaccination (CDC, 2011c); this further illustrates the safety of the Gardasil vaccine.

Cost effectiveness analyses are often employed to justify the use of vaccinations. The simple paradigm of cost-effectiveness is that if a sufficient amount of cost is expended to prevent enough individuals from acquiring a disease, and the cost of the expenditure is greater than the cost of treatment of that disease, then that expenditure is considered cost effective. As applied to HPV vaccination, does it simply cost less to vaccinate a group of people than it is to pay for treatment? The CDC has, for now, decided that it is only cost effective to strongly suggest vaccinations of women against HPV (CDC, 2010c). The goal of solely vaccinating women is that if women are vaccinated, then HPV related cancers will largely be prevented, and this will also protect heterosexual men from infection.

However, for the most part, vaccinating men has also been consistently shown to be cost effective (Elbasha & Dasbach, 2010; Chesson et al., 2011; Kreimer & Chaturvedi, 2011). While most literature strongly supports HPV vaccination in men (e.g., Elbasha & Dasbach, 2010, Kreimer & Chaturvedi, 2011), Chesson and associates (2011) suggest that vaccination of men may not be cost effective if vaccine uptake among women is above 80%. There are two problems with this assertion. Firstly, it ignores the social aspect of HPV vaccination and the hesitation of some mothers to vaccinate their child with a vaccine that prevents an STI (Gordon et al., 2011), which may reduce vaccine uptake in the population of women. Giuliano & Salmon (2008) argue that vaccination of men with Gardasil will become inevitable, as the current program of mandated vaccines for one gender fails to adequately control the spread of HPV due to less than desirable amounts of uptake among girls and women in the population. There are no current population estimates that illustrate the actual uptake percentage of the HPV vaccine by women, but a review of the literature on HPV vaccine uptake among women revealed a low estimate of 37%; Bartlett et al., 2011). This estimate is much lower than the suggested 80% uptake among women to make male vaccination not cost effective (Chesson et al., 2011). This approach also ignores the sexual experiences of men who have sex with men (MSM; Gilbert et al., 2011b), as they are left completely unprotected in a theoretical situation whereby all women are potentially vaccinated.

Lessons Learned From Gendered Vaccination Programs

The NCI predicts that there will be 12,170 new cases of cervical cancer in 2012, with 4,220 associated deaths (NCI, 2012c). Cervical cancer is almost always caused by HPV (NCI, 2012c), but it is not the only cancer that is highly associated with HPV. Almost all anal cancers are caused by HPV, and a large portion of oropharyngeal and penile cancers are causally related to HPV infection (Parkin & Bray, 2006; Watson et al., 2008); these cancers, however, can infect both sexes.

Vaccination programs that have targeted only one gender have generally failed. Out of 75 countries who used the rubella vaccine in 1996, 9% of those countries selectively immunized women (Robertson et al., 1997). In the United Kingdom, the rubella vaccine was solely given to young girls, caregivers, and at-risk older women. The weakness of this approach became evident in 1996 when the rubella virus resurged as a result of susceptibility among men (Tookey et al., 1999; Vyse et al., 2002). It is therefore argued that any viral eradication effort must include both genders. Vaccinating men has the independent benefit of protecting men from HPV related cancers, but can also aid in the prevention of cervical cancer in women. The rubella virus is fundamentally different from HPV in that it is not sexually transmitted, and not typically serious. However, considering how contagious HPV is, a similar pattern of resurgence is potentially possible.

HPV and Men.

Why Study HPV in Men?

Whereas women have a higher incidence of some HPV related cancers than men, the vaccine is passively suggested to be given to males ages 9 through 26 to prevent genital warts (CDC, 2010b; CDC 2011b). Every year in the United States, there are an average of 400 men who are diagnosed with HPV-related penile cancer, 1,500 men are diagnosed with HPV-related anal cancer, and 5,600 men each year are diagnosed with oropharyngeal cancers (CDC, 2011a). While the penile cancer rate is low and rare, it has a very high mortality rate associated with infection (Giuliano et al., 2010). Almost half of all penile cancers are estimated to be due to HPV infection (Parkin & Bray, 2006), and men have higher incidences of every type of oral HPV-related cancer than do women (CDC, 2011a). Oropharyngeal cancer incidences have decreased slightly over time, with a stronger decrease for women than for men (NCI, 2011c). Even with overall oropharyngeal cancer rates decreasing, men still have higher overall incidences of oropharyngeal cancers than women (NCI, 2011c). Further, men have a higher mortality rate associated with oropharyngeal cancers than do women (NCI, 2011c). This further illustrates that women are not the sole risk group for cancerous HPV related outcomes.

Anal cancer trends continue to increase for men and women, with men having shown greater increases in anal cancer morbidity than women over time (NCI, 2011b**).** Anal cancers among men in the US have gone from 0.5 per 100,000 in 1974 to 1.4 per 100,000 in 2008 (NCI, 2011b**)**. There have been statistically significant trend increases in anal cancers over time for both men and women over the past 33 years, but these incidences of anal cancer among men are greater than those among women (NCI, 2011b). Considering the high mortality rate associated with penile cancer, the increases in male anal cancer, and the large gender differences in oropharyngeal cancer rates, prevention efforts need to be aimed at men as well as women.

Genital Warts

Cancer is not the only risk associated with HPV. While strains 16 and 18 are causally related to cancer, strains 6 and 11 are causally attributed to genital warts (CDC, 2011a). Genital warts in themselves can cause negative outcomes. For instance, a study by Smith and colleagues (2010) illustrated that men with HPV in Kenya were almost twice as likely to later contract HIV. The authors suggest that genital warts may be a potential reason for this, as the inflammation caused by genital warts may weaken the natural skin barrier and increase likelihood of HIV transmission (Smith et al., 2010).

Genital warts tend to occur approximately 3 to 6 months after initial infection, but can stay dormant in the host for years before any manifestations of warts occur (Persson et al., 1993; Clarke et al., 1996; Sheppard et al., 1995). For those who do develop genital warts, reoccurrences of warts are common (Sheppard et al., 1995; Filiberti et al., 1993; Maw et al., 1998; Voog et al., 1992) and treatment of warts with harsh chemicals and acids can be painful, debilitating, and expensive.

There are severe mental health implications for contracting genital warts, in addition to the earlier stated physical health risks. Patients with genital warts report greater psychological distress, including anger, shame, isolation, depression, and guilt (Jeynes et al., 2009). Those with genital wart symptoms report a lower Health Related Quality of Life (HRQoL) than those without warts (Jeynes et al., 2009). Internalized shame and intrusive thoughts associated with genital wart infection are strong predictors of poor HRQoL (Jeynes et al., 2009). Moreover, shame associated with having an STI is associated with not seeking medical treatment among adolescents (Fortenberry, 1997). As a result of not seeking medical treatment, young adolescents may expose themselves to greater risks (e.g., contracting HIV or other STIs). There are potentially severe health consequences for men who contract genital warts from HPV infection, and the mental health consequences of having genital warts cannot be ignored.

Associated Risk Factors for HPV Infection in Men

There are differences between men who have sex with women (MSW) and MSM in terms of HPV infection and cancer related outcomes (Johnson et al., 2004; Gilbert et al., 2011c; Anderson et al., 2008; Pierangeli et al., 2008). MSM tend to have generally more positive attitudes towards vaccinating against HPV with the Gardasil vaccine (Gilbert et al., 2011b). This may be due to MSM being consistently at risk for STIs, and the Gardasil vaccine among MSM individuals tends to be evaluated more favorably in MSM than in MSW (Gilbert et al., 2011b). Moreover, having anal sex with other men also predicts HPV infection (Lajous et al., 2005).

HPV is a virus that does not just exist internally, as studies have shown that the scrotum and inguinal area can harbor large amounts of HPV **(**Dunne, Nielson, Stone, et al., 2006**)**. This adds to infection risk, as the virus can easily move to more habitable areas (e.g., the coronal sulcus of the penis, or the anus). Circumcision is a protective factor in preventing later HPV infection, as the virus can stay housed within the foreskin of the penis longer than those in circumcised men, creating a longer persistence of the virus (Svare et al., 2002). HPV can survive for long periods of time in the glans of the penis underneath the foreskin. Biological studies have illustrated that men who are not circumcised are more likely to be infected with HPV than those who are circumcised (Svare et al., 2002).

HPV type 16 is among the most aggressive and virulent strain in terms of cancer risk, and past research has shown it to be most common in men (Dunne, Nielson, Stone, et al., 2006). In a study by Lajous and colleagues (2005), 51.1% of men with HPV had more than one strain. This suggests that men may be at a higher risk for certain HPV related cancerous outcomes, as multiple HPV infections are associated with greater persistence of the virus (Kjaer et al., 2005; Lajous et al., 2005).

HPV Attitudes, Willingness to Vaccinate, and Intentions to Vaccinate.

Evidence has shown that having a vaccine available does not necessarily lead to high uptake in the population (Gonik, 2006; Zimet et al., 2000). Attitudes towards vaccination are a likely reason for this, particularly as Gardasil has attracted a lot of attention on the Internet as a potentially dangerous vaccine. Some barriers to receiving the Gardasil vaccine in men include the belief that men do not benefit from the Gardasil vaccine (Ferris et al., 2008) and that Gardasil is too new to be trusted (Crosby et al., 2011).

Another challenge associated with encouraging HPV vaccination is that HPV infection is, for the most part, invisible. HPV does cause genital warts, which are a very visible manifestation, but this manifestation can easily be suppressed by the immune system, similar to a herpes virus. Long-term outcomes of HPV include cancer, but unlike some other STIs, there are very few immediate outcomes of HPV infection; even genital warts take as long as 6 months to surface, and only occur in a small proportion of those infected with HPV (National Library of Medicine, 2011; CDC, 2011a). As viral symptoms from HPV are essentially invisible for some time, this could cause individuals who are infected to not attend to their infection. Research has shown general support for this, as a lack of knowledge of, and familiarity with HPV predicts a lower likelihood of vaccination (Bendik et al., 2011).

Sexual orientation. Research on MSM's attitudes towards the HPV vaccine has shown gay men to be more favorable to the Gardasil vaccine than are heterosexual men (Gilbert et al., 2011b). Among MSM, those who are HIV positive are more favorable towards the Gardasil vaccine, potentially because they are more health conscious, as HIV treatment adherence is paramount for those infected (Gilbert et al., 2011b). Gay and bisexual identified men tend to have more accurate knowledge of HPV related outcomes, as well as higher perceived likelihood of contracting HPV (Gilbert et al., 2011b). MSM tend to have more severe HPV related outcomes than do heterosexual men (Gilbert et al., 2011b), and are 17 times more likely to develop anal cancer from HPV 16/18 infection than do MSW (CDC, 2011b).

While the differences between straight and gay men in terms of outcomes have been demonstrated, HPV type 16 is among the most common HPV strain among both gay and heterosexual identified men (Nyitray, Carvalho da Silva et al., 2011). As HPV type 16 is the most virulent cancer causing strain of HPV (Svare et al., 2002), it is important for prevention work to address both gay and heterosexual identified men.

Cost. The findings are mixed as to how the cost of Gardasil is associated with intentions to receive the Gardasil vaccine. While on one hand, cost is a factor that is consistently predictive of willingness to vaccinate, acceptance of the HPV vaccine, and intentions to receive the vaccine among men, gay men, and women (Simatherai et al., 2009; Allen et al., 2009; Gerend & Barley, 2009; Daley, Marhefka, Buhi et al., 2010; Burke, Vail-Smitch, et al., 2010; Young et al., 2010; Rhodes & Arceo, 2004). On the other hand, cost may not be as consistent a barrier as it has been reported in past research. In multivariate analyses, concerns about HPV vaccine cost seems to disappear as a significant predictor of HPV intentions to vaccinate, and acceptability of the vaccine (Hernandez et al., 2010; Crosby et al., 2011). This suggests that cost may be concomitant with other predictors (e.g., having healthcare), and may not be an independent predictor of receiving the vaccine when added to a multivariate analysis. In a study by Hernandez and colleagues (2010), those who cited cost as a barrier to vaccination were *more* likely to intend to vaccinate with Gardasil, and those who indicated that cost would be a major deciding factor in HPV vaccination were *more* likely to intend to vaccinate as well. This could be due to the many different cross-sectional samples utilized to study the effects of cost on HPV vaccine acceptance, willingness, and intentions to vaccinate.

The retail cost of the HPV vaccine is $130 dollars per dose, for a total of $390 dollars for the entire 3 shot series (CDC, 2011d). This cost is much higher than that of other vaccines, and this potentially creates a greater barrier to vaccination for those without means to pay. Considering this, men's estimation of the personal amount they are willing to pay for the

Gardasil vaccine is, on average, between $110 and $130. This could further illustrate that cost may not be as great a barrier as it is reported to be. What is studied less is the perceived ability to obtain the vaccination, which may be also be associated with perceived ability to pay.

The media. Straight identified men report a lower acceptance of the HPV vaccine than do women (Gilbert et al., 2011). When compared to MSM, straight men have less positive attitudes towards HPV vaccination. Another study showed that that having greater knowledge of HPV and having heard of the vaccine was associated with a decreased willingness to receive the vaccine (Daley et al., 2010). A potential reason for this is a lack of knowledge about HPV and the Gardasil vaccine. The outreach programs by Merck & co. have urged women to be vaccinated in their advertisements. The media may have a strong influence on health beliefs and behaviors (Hay et al., 2009), and these advertisements may have influenced men to not see themselves at risk. In fact, research on male HPV vaccine attitudes has shown this to be a common belief. Men have reported in qualitative studies that they are not worried about HPV (Allen et al., 2009), do not perceive themselves as at-risk for HPV infection (Allen et al., 2009), and believe that the HPV vaccine does not benefit men (Crosby et al., 2011). Some research shows that media can be used to improve male intentions to receive the Gardasil vaccine. For example, a study by DiClemente and colleagues (2011) concluded that any form of HPV prevention message given via a short PowerPoint presentation was enough to significantly increase intentions to vaccinate with Gardasil among men.

There is a wealth of misinformation about vaccines on the Internet (Kata, 2010; Zimmerman et al., 2005), including entire websites dedicated to “proving” that Gardasil causes seizures, disability, and death in many of those who receive the vaccine (e.g., “TruthAboutGardasil.com”). These websites tend to use anecdotal evidence, logical fallacies, and scare tactics to suggest that Gardasil is not safe (Zimmerman et al., 2005). In spite of the low harm rates associated with receiving the Gardasil vaccine, there is still mistrust of the Gardasil vaccine and vaccinations in general on the Internet. The Internet represents a pathway for individuals to gain information that may or may not be accurate, and vaccine information gathered from the Internet may contain false information (Zimmerman et al., 2005). What is most concerning about these claims is that they are typically untrue, as Gardasil is as safe as other vaccines available (FDA, 2009). This information may in turn steer men away from thinking they are at risk for HPV infection, that HPV is dangerous, and that men do not need to be protected from HPV.

Moreover, television commercials by Merck & co. are targeted at educating women about HPV infection, and encouraging early vaccination with Gardasil. These advertisements are deliberately targeted at women. Some newer advertisements have begun to target men and boys, but these advertisements may not be widespread enough to have the intended impact. Despite CDC suggestions that men vaccinate against HPV along with women, there are few advertisements targeted at a male audience. This may create a normative belief, suggesting to men that they do not need the Gardasil vaccine, and potentially engender a belief that HPV is not a concern for them. Despite clear research on the topic of media influence, there is very little literature that seeks to identify how media influences both Gardasil vaccine attitudes, and intentions to receive the Gardasil vaccine.

The media can also present images and discourse from political figures that may relate inaccurate information on vaccination. For instance, on September 12, 2011 Republican presidential hopeful Michele Bachmann publically proclaimed that Gardasil causes retardation, based off an encounter with a mother who claimed that Gardasil caused her daughter to become mentally retarded. This comment sparked outrage from the American Academy of Pediatrics (AAP), who insisted that the vaccine was safe (AAP, 2011). Statements like this from political figures or media personalities may make individuals, including men, question the safety of the Gardasil vaccine unnecessarily as they come into contact with inaccurate media sources.

Sexual behavior. As sexual behavior is the primary method by which individuals contract HPV, past research has assessed how sexual activity influences attitudes towards the HPV vaccine. Research generally shows positive relationships between sexual behavior and HPV vaccine acceptance, willingness, and intentions to vaccinate. Being sexually active, having multiple partners, and having oral sex are all associated with willingness to vaccinate with the HPV vaccine, acceptance of the Gardasil vaccine (Gerend & Barley, 2009; Ferris et al., 2009; Crosby et al., 2012). These findings can be explained in many ways. Men who have sex often may be more informed about STI prevention, and may have more positive attitudes towards Gardasil as a result. Frequent sexual activity may expose an individual to resources whereby information about HPV is available. For instance, a sexually active individual may retrieve condoms from free resources (e.g., medical clinics) and subsequently gain information about Gardasil and HPV from resources available there.

One robust predictor of intent to vaccinate among men is ever having had oral-genital sex (Crosby et al., 2011; Crosby et al., 2012). This finding is curious, as it seems that oral-genital sex is associated with intent to vaccinate, over and above other sexual behavior predictors that might seem more relevant (e.g., multiple penile-vaginal sex partners, having had sex with a male partner, mutual masturbation, and unprotected penile-vaginal sex). There are a few reasons that might explain this relationship. Oral sex tends to be more common than vaginal sex in young samples (Halpern-Felsher et al., 2005; Malacad & Gretchen, 2010). More frequent oral sex might also create a heightened awareness about disease transmission, and subsequent perceived risk for oral cancers (Crosby et al., 2012). This in turn may lead individuals to be more willing to take any medical preventative measures to reduce any kind of infection (e.g., receiving the Gardasil vaccine).

Medical provider influence. In numerous studies, willingness to receive Gardasil was associated with a belief that a doctor would recommend the vaccine (Gilbert et al., 2011a; Gilbert et al., 2011b; Daley et al., 2010). Medical providers can be a source of knowledge about disease and health behaviors. Medical providers are authority figures that can dispel incorrect information learned from media sources. In fact, the field of health psychology has examined patient-provider interactions in terms of health behaviors (Barlett et al., 1984; Becker, 1985), strengthening the notion that medical providers can cause behavior change.

Medical attendance can be a gendered event, as women tend to take a more active role in their medical decisions (Arora & McHorney, 2000), and women tend to receive more medical information than men (Waitzkin, 1985). Women often receive routine pap tests, whereas men have no comparable routine examination that could potentially detect HPV related cancers in their early stages. Pap tests have a clear HPV-related focus and patients may potentially dialogue with their medical provider about the vaccine. Among women, a provider recommendation for vaccination is significantly associated with being vaccinated against HPV, with a stronger recommendation being more likely to increase vaccination than a weaker recommendation (Rosenthal et al., 2011).

Racial differences. The literature on racial differences in HPV vaccine acceptance, willingness, and intentions to vaccinate is mixed. Many studies that have controlled for race have found significant effects over and above race. However, studies have also shown significant differences between races in vaccine acceptance and willingness to receive the Gardasil vaccine (Ferris et al., 2009). A study by Ferris and colleagues (2009) demonstrated that white men were generally more undecided about receiving the HPV vaccine, and when compared to White men, Black men were more willing to receive the HPV vaccine.

Racial differences in intentions to receive the Gardasil vaccine may attenuate in multivariate statistical analyses. Many studies on racial differences illustrates that race may not be an influential factor in intentions to receive the Gardasil vaccine. For example, Daley and colleagues (2010) found that race was not a significant predictor of intentions to receive the Gardasil vaccine, while Hernandez and colleagues (2010) found no racial differences in awareness, attitudes, and intent to vaccinate with the HPV vaccine.

One potential criticism of these research studies is that they have utilized largely white samples. All articles cited had a majority of white identified individuals as participants. Furthermore, these studies may be influenced by time of data collection. Variability in any type of HPV vaccine related questions could be constricted, as the HPV vaccine has only been available since 2006. A lack of racial diversity in the samples may be a crucial variable that may mask true racial differences in intentions to receive the HPV vaccine.

Use of Theoretical Frameworks in HPV Research

Past research has attempted to utilize portions of theoretical models to predict Gardasil acceptance, willingness, and intentions to initiate Gardasil vaccination. These studies mainly look at variables that are a part of the health belief model (HBM), but further provide theoretical justification for use of other theory.

The Health Belief Model

The HBM suggests that the likelihood of an individual participating in an action necessary to avoid a disease is dependent on the perceived susceptibility to the disease, the perceived severity of the disease, the perceived benefits of engaging in a behavior that will prevent a disease, the perceived barriers to engaging in that behavior, and "cues to action" which refer to influences, either inside or outside, oneself that encourage one to engage in a behavior (e.g., breaking out with acne would be a cue to action to engage in face washing behavior).

Past studies have shown some support for parts of the health belief model in predicting intentions to vaccinate with HPV vaccine. In a study of parental intentions to vaccinate their children, parent's perceived benefits of vaccination and perceived susceptibility of their child contracting HPV were significant predictors of intentions to vaccinate their male child (Dempsey et al., 2006). Among adult men, perceived susceptibility to HPV was associated with willingness to receive the HPV vaccine, and willingness of parents to vaccinate their child (Crosby et al., 2011; Dempsey et al., 2006; Dempsey et al., 2011), as well as in other studies that predicted feelings towards receiving the HPV vaccine (Boehner et al., 2003; Friedman and Shepeard, 2006). Specifically in a study by Dempsey and colleagues (2011), all arms of the HBM were predictive of parental intent to vaccinate their young, adolescent male children, except for perceived severity (cues to action were unmeasured). Perceived barriers such as cost and vaccine safety (discussed earlier) may not be the best predictors of Gardasil vaccine acceptability in men. In a recent study of women, Gerend & Shepherd (2012) found that perceived severity in itself was not a significant predictor of receiving the HPV vaccine. Moreover, perceived severity has not been associated with vaccine acceptability in other studies of samples with men and women examining an array of vaccination behaviors (Boehner et al., 2003; Dempsey et al., 2006; Kahn, Rosenthal, Hamann, & Bernstein, 2003). A caveat to this research is that these studies examined acceptability, and not likelihood, willingness, or intentions to receive the HPV vaccine.

Perceived severity of HPV has also been a poor predictor of acceptability of the Gardasil vaccine in studies comparing gay and bisexual men against heterosexual men. HIV negative men have no relationship between perceived severity and Gardasil acceptability, while HIV positive men with higher perceived severity have greater acceptability of the Gardasil vaccine (Gilbert et al., 2011a). An interesting factor in male Gardasil acceptance and perhaps intentions to receive the vaccine seems to be HIV status. Gilbert and colleagues (2011b) found that HIV infected gay men had a strong positive relationship between perceived severity of HPV and intentions to vaccinate, while HIV-negative gay men had no relation between perceived severity and intentions. This could illustrate that individuals with chronic illness may be more sensitive to preventative health measures.

The HBM has historically done a poor job of predicting the likelihood of receiving the Gardasil vaccine. In many studies, HBM factors like perceived severity of HPV infection were not predictive of acceptability of the HPV vaccine (DiAngi, Panozzo, Ramogola-Masire, Steenhoff, & Brewer, 2011; Boehner et al., 2003; Dempsey et al., 2006; Kahn et al., 2003). Many studies do not use theoretical frameworks to study Gardasil vaccine initiation, and of those studies that do, they sample mostly women. Furthermore, the use of the HBM has often been studied with parents' intentions to vaccinate their children. This leaves adults relatively ignored in the literature that attempts to use theory as a framework to predict intentions to receive the HPV vaccine. Instead of using the HBM as a model for predicting health behavior engagement, the Theory of Planned Behavior (TPB) may provide a more accurate framework for predicting health behaviors, such as receiving the Gardasil vaccine.

The Theory of Planned Behavior

The TPB posits that the strongest predictor of any given behavior is the intention to engage in that behavior (Ajzen, 1991). The TPB model posits that attitudes towards the behavior, perceived normativity of that behavior, and one's ability to control their engagement in that behavior (perceived behavioral control) are the most proximal predictors of intentions (Ajzen, 1991). Attitudes in the TPB consist of two constructs: behavioral beliefs, and attitudes towards the behavior. Behavioral beliefs refer to the perceived consequences of engaging in a particular behavior, while attitudes towards the behavioral refer to the evaluation of the behavior as positive or negative. A recent comparison of the HBM and the TPB has given strong evidence for the TPB as the better model for predicting vaccine uptake among young adult women (Gerend & Shepherd, 2012). As such, the TPB may perform best as a model for predicting HPV vaccine intentions in men as well. Furthermore, TPB has also been successful in predicting many different health behaviors (e.g., Armitage & Conner, 2001; Bogart & Delhanty, 2004).

Perceived norms. Perceived norms represent the perception of important others' beliefs regarding a behavior (Ajzen, 1991). Moreover, perceived norms also include a reflection on how relevant one perceives those beliefs of important others' to be. Past research has illustrated some of the ways in which norms can influence the willingness to receive the HPV vaccine. For example, a study by Reiter and colleagues (2011), young boys were more willing to receive the HPV vaccine if they perceived that their peers would accept them for it, if they would later regret not getting the vaccine, and perceived themselves to be vulnerable to getting HPV; of these predictors, perceived peer acceptance was the strongest. There are more promising predictors of willingness to receive the Gardasil vaccine that are associated with parental attitudes. Among minor young adults, parental attitudes tend to be strongly associated with male child attitudes towards HPV (Reiter et al., 2011). In fact, recommendations from powerful others (e.g., parents, doctors) tend to be strong predictors of acceptance of the Gardasil vaccine (Ferris et al., 2008, 2009; Boehner et al., 2003; Hollander, 2010).

Attitudes. Attitudes in the TPB model consist of two constructs: Behavioral beliefs and attitudes towards the behavior. Behavioral beliefs refer to the believed consequences for engaging in a particular behavior. Attitudes towards the behavior refer to the evaluation of the behavior as positive or negative. Together, these two constructs represent the attitudes variable in the TPB model.

Parental attitudes towards HPV have been correlated with willingness to receive the Gardasil vaccine in young male children. A study by Reiter and colleagues (2011) measured the predictors of parent intention to vaccinate their male child (ages 11-17) with an HPV vaccine, as well as child intention to receive an HPV vaccine. Results showed that numerous different attitudes (e.g., harmfulness of the vaccine) towards the HPV vaccine were significant, predictors of intentions to vaccinate their child. Uncertainty about the HPV vaccine seems to be readily apparent in all research reports that examine it. A qualitative investigation by Allen and colleagues (2009) reported that the men in their sample reported apprehension towards Gardasil based on reported fears of side effects and safety of the vaccine. One participant even stated that “there’s been so many things that women have taken that have supposed to help them which have ended up being negative for them” (Allen et al., 2009, p.536). These beliefs that Gardasil is unsafe, in turn, have been shown to predict, in general, negative attitudes towards receiving the HPV vaccine (Ferris et al., 2009; Boehner et al., 2003). These predictors also tend to be very robust. A study by Crosby and colleagues found that believing that the HPV vaccine was too new to receive was one of three remaining significant predictors of intent to vaccinate with Gardasil when entered into a multivariate model along with many other variables.

The items created by (Reiter et al., 2011) for the purposes of their research contained questions that tapped into attitudes towards Gardasil vaccination, but have mainly been used for parental attitudes towards vaccinating one's child (Reiter et al., 2011). These attitudinal factors tend to be predictive of receiving the Gardasil vaccine. Past research has taken portions of attitudinal beliefs (as defined by the TPB) to predict HPV vaccine acceptance and intention to initiate vaccination, but attitudinal variables tend to be poor predictors of a behavior alone (Fishbein & Ajzen, 1974). Little research has specifically looked at attitudes towards HPV and Gardasil among adult men.

Perceived behavioral control. Perceived Behavioral Control (PBC) is the most robust predictor in the TPB. This construct represents the perceived ease at which an individual believes they can engage in a particular behavior. PBC theoretically predicts intentions to engage in a behavior, as well as directly predicts the behavior itself (Ajzen, 2002). Much research has used measures of self-efficacy to describe PBC, but Ajzen (2002) objects by stating that PBC conceptually represents both perceived self-efficacy, and perceived controllability. For efficacy to be truly predictive of a behavior, an individual must not only believe he or she can engage that behavior (self-efficacy), but also feel that they have control over their ability to engage in that behavior (perceived controllability). Furthermore, Terry & O'Leary (1995) illustrated that perceived controllability and perceived self-efficacy were two separate parts of PBC, and have better predictability separately than together. Ajzen (2002) concludes that PBC is better conceived as a factor that makes up two latent constructs: perceived self-efficacy and perceived controllability.

No study to date has examined PBC in relation to receiving the Gardasil vaccine, but a few studies have included measures that shed light on its predictive power. A study by Crosby and colleagues (2011) found that self-efficacy to be vaccinated with Gardasil is not predictive of intentions to receive the vaccine. A study by Hernandez and colleagues (2010) included a variable in their analysis of vaccination intentions that asked whether transportation to a clinic to receive the vaccine would influence vaccination intentions; this was not significant in their final analysis. The studies suggest that PBC-related variables may not factor into intentions to receive the Gardasil vaccine.

While past studies may not support PBC in predicting HPV vaccination, the context of the research on Gardasil and the HPV vaccine must be taken into account when critically analyzing the results of past research. Gardasil was not approved for male use until years after the vaccine was introduced, and the vaccine is still relatively new. Older studies, and even currently published ones, use data from around or before the time when Gardasil was approved for male use. It is plausible that PBC may not have been a relevant predictor of intentions to receive the HPV vaccine because participants may never had heard of it, or they did not believe it is for them. In fact, Crosby and colleagues (2011) also found that belief that one should wait to be vaccinated because the Gardasil vaccine is too new was a significant predictor of not intending to receive the Gardasil vaccine. The key fact that must be considered for future research is that the more recent studies, with newer data, will provide the most useful information on intentions to receive Gardasil, as the vaccine becomes more normative and the risks associated become better understood by the lay population.

As many studies use the health belief model as a partial framework, but do not complete the model by including all relevant predictors. This is a common criticism of the literature that utilizes the health belief model (Bogart & Delahanty, 2004). Psychosocial theories on health behaviors are helpful for predicting whether or not individuals participate in certain health behaviors, including receiving the Gardasil vaccine. While these studies present interesting associations of willingness to receive the HPV vaccine, the TPB provides a standard framework that predicts intentions to engage in health behaviors (Ajzen, 1991), and can be applied to intentions to receive the vaccine. A major benefit of using the TPB is its history of being used in successful studies, many of which include sexual topics like condom usage (Bogart & Delhanty, 2004).

The Present Study

The purpose of the study is to examine intentions to receive the HPV vaccine among men. The present study will seek to use the TPB to model intentions to receive the HPV vaccine among young adult males. The HPV vaccine, Gardasil, has only been available since 2006, and most of the research currently published was done with data collected very near, or even before, the time when the vaccine became available. As such, with the majority of the HPV research literature focusing on women and their subsequent HPV risk, attitudes, and willingness to receive the Gardasil vaccine, additional research is warranted to address men as well.

Hypothesis 1: Males will have adequate variability in their intentions to receive the Gardasil vaccine. Past research that has evaluated males intentions has found adequate variability in questions that measure HPV vaccination intentions, willingness, and acceptance (e.g., Reiter et al., 2011; Daley et al., 2011; Daley et al., 2010). Daley and colleagues (2011) reported high intentions in to receive the Gardasil vaccine in the next 6 months (greater than 70% of the participants rated themselves as at least likely to receive the vaccine). Evaluating the skewness and kurtosis values for the intentions variable will statistically test this hypothesis. These skewness and kurtosis values are hypothesized to be less than |1.5|. If the values are greater than this, the score will be dichotomized so that the intentions variable represents those who intend to receive the HPV vaccine in 6 months, and those who do not intend to receive the HPV vaccine in 3 months.

Hypothesis 2: As race has been inconsistently associated with intentions to receive the HPV vaccine, a one-way ANOVA will be performed to evaluate racial differences in intentions to receive the Gardasil vaccine. Bonferonni post hoc tests will evaluate main effects of racial differences. It is hypothesized that non-white individuals will have greater intentions to receive Gardasil.

Hypothesis 3*:* As intentions to receive the Gardasil vaccine have been shown to be different as a function of sexual orientation, a one-way ANOVA will be performed to evaluate differences in intentions to receive the vaccine among gay, bisexual, straight, and queer identified adults. It is anticipated that non-heterosexual identified participants will report greater intentions to receive the Gardasil vaccine.

Hypothesis 4*:* Past research suggests that individuals who have greater sexual partners report greater willingness to receive the Gardasil vaccine, as well as acceptance of the vaccine (Gerend et al., 2008; Jones & Cook, 2008; Ferris et al., 2009). As such, it is hypothesized that a spearmans rho correlation will reveal a significant positive correlation between number of sexual partners in the past 3 months and intentions to receive the Gardasil vaccine.

Hypothesis 5: As DiClemente and colleagues (2011) illustrate, something as simple as a commercial can increase intentions to receive the Gardasil vaccine among men. As such, it is hypothesized that those with who are highly influenced by Gardasil commercials will have significantly lower intentions to receive the Gardasil vaccine.

Hypothesis 6: Attitudes towards HPV vaccination, perceived norms associated with HPV vaccination, and perceived behavioral control will all independently predict intentions to be vaccinated against HPV with the Gardasil vaccine. Furthermore, the TPB model will fit the data well, with a Root Mean Squared Error of Approximation (RMSEA) less than .05. The chi-square value for the overall model will not be significant, indicating that there is not a significant amount of unexplained variance in the model. The model will control for racial demographics, sexual orientation, and sexual behavior, as these factors have been associated with willingness to receive the Gardasil vaccine.

The postulated direction of relationships is as follows: those with more positive attitudes towards Gardasil will report greater intentions to receive the Gardasil vaccine. Those with more positive perceived norms will report greater intentions to receive the Gardasil vaccine. Those with greater perceived behavioral control will report greater intentions to receive the Gardasil vaccine.

Method

Procedure

Power analysis illustrated that with 10 predictors in the model, an $n = 155$ participants were sufficient to detect a small effect at .80 (80%). Participants were undergraduate psychology students who completed a survey online. Participants were given course credit for their involvement in this project. Participants were asked if they would like to complete a survey on sexually transmitted disease attitudes. Before participants began the survey, they completed an electronic informed consent that detailed that participation is voluntary and they could refuse to answer any questions that they are not comfortable answering. Only those who identified as male and between the ages of 18-26 were asked to participate. The present study was completely anonymous and approved by the Institution Review Board (IRB) at Virginia Commonwealth University (VCU).

Materials

Demographics. Participants were asked about their gender, sexual orientation, ethnicity, age, and relationship status. Gender was asked to ensure that only male identified participants are participating. The main purpose of asking about age was to ensure that participants fell between the ages of 18 and 26.

Attitudes Towards HPV Vaccine. Attitudes towards HPV were measured using the "harms" subscales of the Carolina HPV Immunization Attitudes and Beliefs Scale (CHIAS; McRee et al., 2010). This subscale measured HPV attitudes and beliefs. The "harms" subscale contains 6 items ($\alpha = .69$) and measures the degree to which individuals perceive the HPV vaccine to be harmful (e.g., "The HPV vaccine might cause lasting health problems."). Responses ranged from 1 (*Strongly Agree*) to 4 (*Strongly Disagree*). In addition to these items, the present study utilized additional items to further examine the construct of attitudes, by using items borrowed from a sample TPB questionnaire (Ajzen, 2012), these items had responses ranging from 1 (*Strongly Agree*) to 4 *(Strongly Disagree*). These questions measured general attitudes towards the HPV vaccine. These measures will together estimate the construct of "Attitudes towards receiving the HPV vaccine". Higher scores on these measures will represent more positive attitudes towards the HPV vaccine. Relevant items were reverse coded.

Perceived norms. Perceived norms were measured with an aggregate of theoretically oriented items from a sample TPB questionnaire (Ajzen, 2012). An example of one of these items is "My parent would think it would be a good idea for me to receive the Gardasil vaccine." Responses ranged from 1 (*Strongly Agree*) to 4 (*Strongly Disagree*). As perceived norms also contain an evaluative component, participants were asked questions that measure how they evaluate their norms (e.g., “How much do you value your friends’ opinions in your decision to get the Gardasil vaccine?“). Responses ranged from 1 (*Very Little*) to 5 *(Very Much*).

Perceived behavioral control. The “barriers” subscale of the CHIAS was combined with 3 theoretically relevant items from Azjen’s TPB sample survey (Ajzen, 2012) to measure perceived behavioral control. This subscale contains 5 items **(**α = .69), plus 3 from Ajzen’s sample survey for a total of 8 items, and measures perceived ability to receive the HPV vaccine (e.g., “I am concerned that the HPV vaccine costs more than I can pay”), responses ranged from 1 (*Strongly Disagree*) to 6 (*Strongly Agree)* or 1 (*Not difficult at all*) to 6 (*Extremely Difficult)* where appropriate. Control beliefs were measured also (e.g., “Unanticipated events would make it unlikely for me to receive the Gardasil vaccine”), responses ranged from 1 (*Strongly Disagree*) to 5 (*Strongly Agree*). Together, these two constructs together represent the latent construct of “Perceived behavioral control towards receiving the HPV vaccine”. For perceived self-efficacy, higher scores represent greater efficacy towards receiving the HPV vaccine. For perceived controllability, higher scores represent *less* controllability towards receiving the HPV vaccine.

Sexual behavior. Participants were asked to report the number of sexual partners that they had in the past 3 months. Research has demonstrated that individuals who are sexually active are more willing to receive the Gardasil vaccine (Gerend et al., 2008; Jones & Cook, 2008; Ferris et al., 2009; Crosby et al., 2012).

Media influence. Participants were asked two types of questions, the first type measured media influence from the HPV vaccine commercials, such as “Seeing the Gardasil commercials on TV make me feel like I shouldn’t get the vaccine.”. The second type of question measured general use of media for health information, by asking questions such as “How often do you use the Internet/Radio/Television for health information?". Similar questions have been used in past research (Ben-Zur et al., 2012). Responses ranged from 1 (*Strongly Disagree*) to 5 (*Strongly Agree)* and 1 *(Not at all often)* to 5 (*Very often*) for each question where appropriate. Each item included the option to opt out due to non-exposure (e.g., "N/A, I have not seen a Gardasil commercial."). Higher scores on this measure indicate greater influence from the media when deciding to vaccinate with the HPV vaccine.

HPV vaccination intention. Behavioral intention was measured with a single item "There is a vaccine available that can protect you against HPV (e.g., Gardasil), to what degree do you intend to receive this vaccine within the next 6 months?" Responses ranged from 1 (*Not at all likely*) to 4 (*Very likely*). Items similar to this have been used in past research (e.g., Daley et al., 2011). Higher scores on this item represent greater intention to receive the HPV vaccine.

Data Analysis

As the present research used measures constructed for the purposes of this specific study, factor analysis was performed on all scales used in this study. Reliabilities were also checked for each sub-factor, and items that load onto both factors will be deleted so as to have a goal Cronbach's alpha above .70.

One-way ANOVAs were performed to test differences in sexual orientation as well as racial differences in intentions to receive the HPV vaccine. Tukey post-hoc tests were performed to confirm significant mean differences between these groups.

Spearman's rho correlation tested the hypothesis that greater sexual frequency (defined as the number of sexual partners in the past 3 months) will be associated with greater intentions to receive the HPV vaccine. It is expected that those with greater sexual frequency will report greater intentions to receive the HPV vaccine.

Pearson's r correlations were performed to examine the relationship between media influence and intentions to vaccinate.

The TPB posits that normative beliefs, attitudes towards the behavior, and perceived behavioral control will predict behavioral intentions (Azjen, 1991). Figure 1 illustrates the hypothesized structural equation model of vaccination intentions. This model was tested using AMOS software version 20.

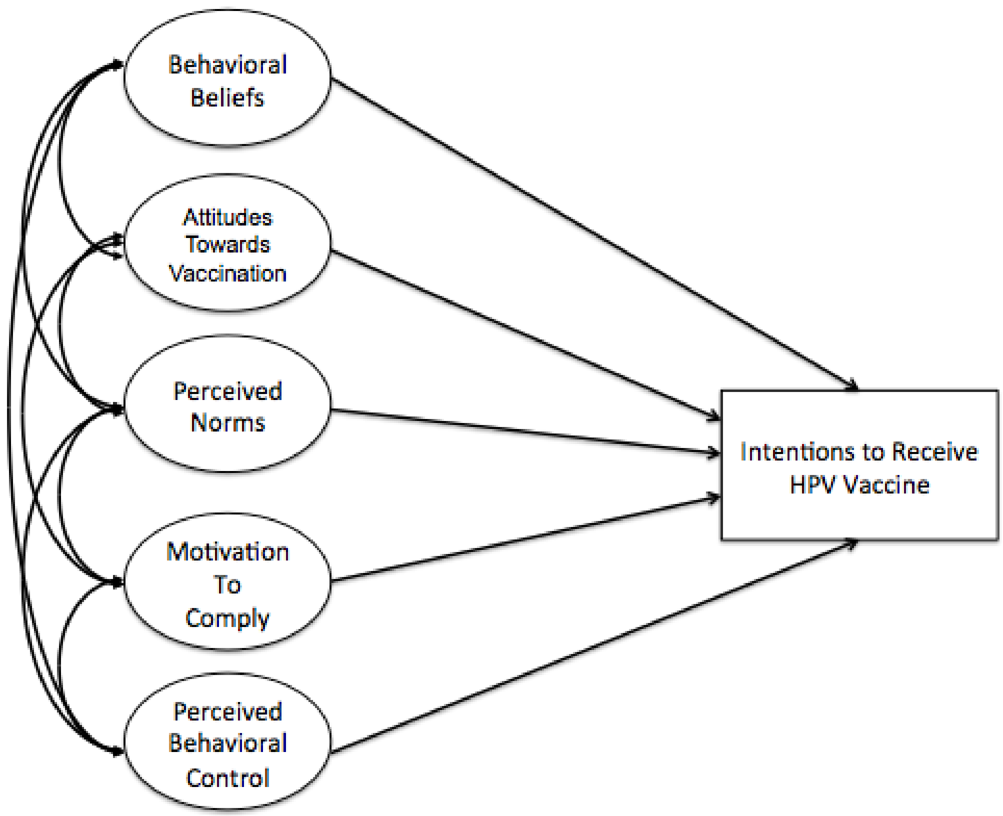

Figure 1. Proposed structural equation model to test the theory of planned behavior.

Data Quality Assurance

Participants who reported already having received the HPV vaccine were eliminated (n = 41), leaving a final sample size of n = 226. As sample size was small, and many parameters are being estimated, a Bollen-Stine bootstrap was performed to correct for small sample size (n = 500 samples). Reliability analyses (Cronbach's α) and exploratory factor analyses were performed to eliminate potentially poorly worded or poor fitting items to the respective constructs being measured. An additional benefit of these procedures was to ensure adequate power, and to further reduce the amount of parameters estimated given the relatively small sample size (*n* = 226). There were no missing values in the present dataset, so the full sample size of 226 was retained throughout the analysis. Analyses were performed with AMOS version 20 and SPSS version 20.

Results

The sample consisted of 50.6% White identified individuals, 18.3% African-American, 7.2% Hispanic/Latino, 17.4% Asian American, and 6.4% identified as “Other”. Average age was 19.23 (*SD* = 1.78). Most of the sample consisted of students in their freshman year of college (62.1%), with 19.1% identifying as sophomore, 12.3% as Junior, 6.0% as Senior, and .4% (*n* = 1) as in their 5th year. Most of the sample (92%) identified as heterosexual, with 1.8% identified as bisexual, and 6.2% identifying as gay/homosexual.

Hypothesis 1

Normality of the vaccination intentions item was examined using skewness and kurtosis statistics. As a general rule of thumb, skewness and kurtosis less than |1| suggest a normal distribution. Results indicate that the HPV vaccination intention item was normally distributed (*Skewness* = .052, *SE* = .16), (*Kurtosis* = -.638, *SE* = .32), *M* = 2.42, *SD* = .86; Range: 1 – 4.

Hypothesis 2

The second hypothesis was to evaluate racial differences in the intentions variable. A one-way ANOVA as performed on the intentions to receive the HPV vaccine variable, which indicated significant variability as a function of race *F*(4, 221) = 4.45, *p* = .002. Tukey post-hoc tests indicated that the only significant racial difference was that between Whites (*M* = 2.27, *SD*

= .87) and those who identified themselves in the "Other" category (*M* = 3.0, *SD* = .56), *p* = .02. This indicates that those who identified as "Other" in their racial category had significantly greater intentions to receive the HPV vaccine than did Whites. All other racial comparisons were performed, and were not significant (*p*'s > .05; Figure 2).

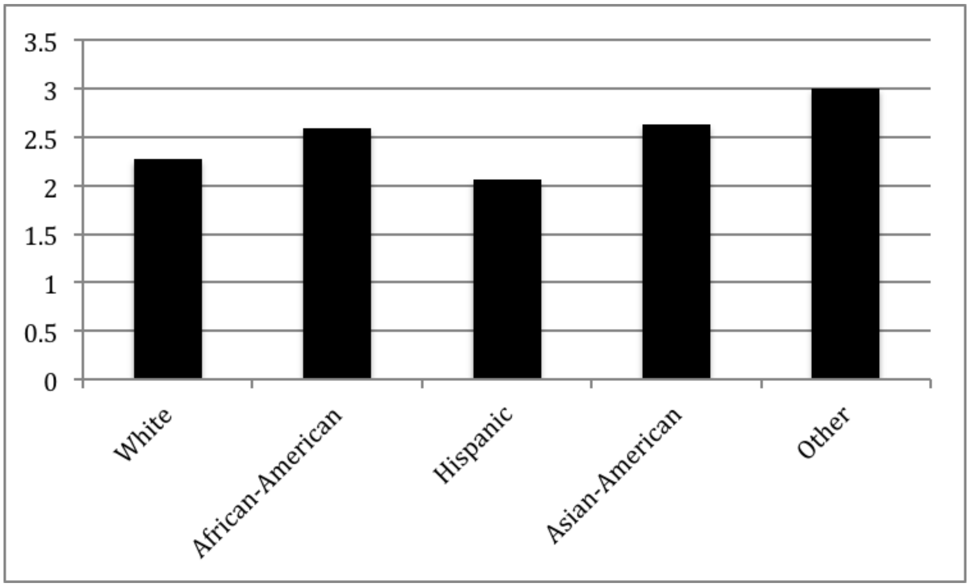

Figure 2. Means of HPV vaccination intention among different races.

Hypothesis 3

The third hypothesis examined how sexuality was associated with HPV vaccination intentions. A one-way ANOVA was performed to examine differences in HPV vaccination intentions among those who identified as straight (heterosexual; *n* = 208), bisexual (*n* = 4), gay (Homosexual; *n* = 14). Results indicated that there was no effect of sexuality on HPV vaccination intentions *F*(2, 223) = 0.85, *p* = .43. The simple means for gay (*M* = 2.42, *SD* = .86) and bisexual men (*M* = 2.75, *SD* = .86) were slightly higher than that of heterosexual men (*M* = 2.39, *SD* = .87), but not outside the range of sampling error. See Figure 2 for a visual representation of the means.

Due to this small sample sizes per cell for sexual orientation, Cohen's *d* effect sizes for the mean differences were computed. Cohen's guidelines suggest that a value of .2 is small, .5 is moderate, and .8 is large in effect. The difference between gay and heterosexual men yielded a Cohen's *d* value of .04, and the difference between heterosexual and bisexual men yielded a Cohen's *d* value of .42. This suggests that the mean differences between heterosexual and bisexual men indicated a small effect, while the differences between heterosexual and homosexual men had effects that did not even reach the threshold of "small" (.2). As only 4 total participants identified as bisexual, a dummy variable was created to compare heterosexual vs. non-heterosexual individuals in their intentions to receive the HPV vaccine. Results indicate no statistically significant difference in vaccination intentions, $t(224) = -1.29$, $p = .20$, $d = .34$, but a small effect size of the mean differences between the two groups.

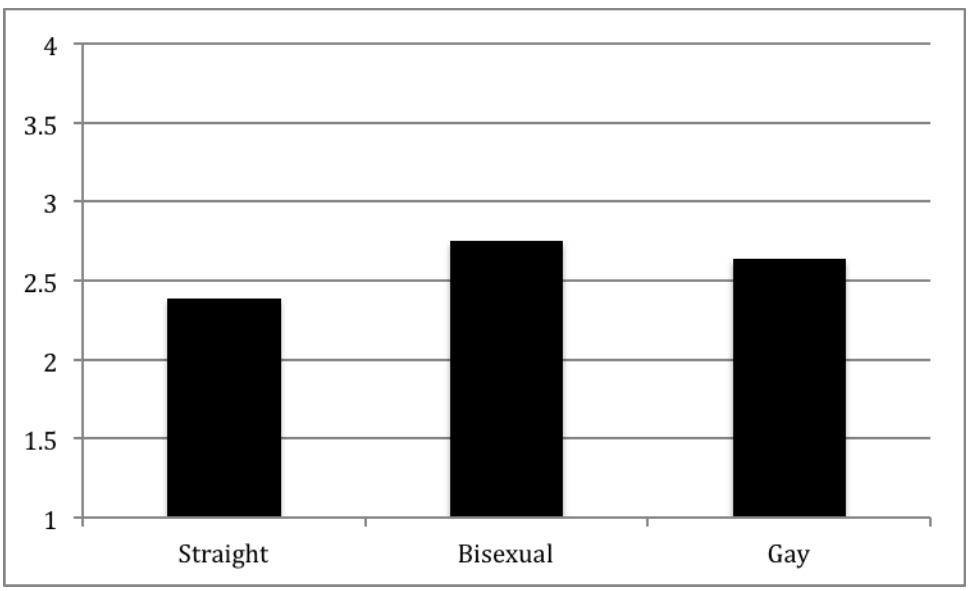

Figure 3. Means of HPV vaccination intentions among different sexual orientations.

Hypothesis 4

The fourth hypothesis was to examine the relationship between number of sexual partners and intentions to receive the HPV vaccine. Results suggest that there is no relationship between the number of sex partners in the past 3 months and intentions to receive the HPV vaccine $r_s(223) = -.06$, $p = .36$.

Hypothesis 5

The fifth hypothesis examined the impact of media influence on HPV vaccination intentions. Given that a "NA" option was added to each question, a total of $n = 117$ people were deleted from analysis for answering "no" to any question. This left a total of 118 participants to analyze responses for media influence. An exploratory factor analysis was performed using principal components analysis as an extraction technique and varimax rotation as a rotation technique. Results indicated two factors that were indicated *a priori*. The first factor was media influence [eigenvalue = 3.89, $R^2 = 35.35$, $\alpha = .88$] and, the second factor was use of the media for health information [eigenvalue = 1.92, $R^2 = 17.41$, $\alpha = .62$], see Table 1 for factor loadings. As all items clearly loaded onto their respective factor, no items were deleted. Simple correlations revealed that media influence was not associated with HPV vaccination intentions in men $r(116) = .15$, $p = .10$. There was also no significant relationship between use of media for information and HPV vaccination intentions $r(116) = .02$, $p = .86$. As there was no relationship between media influence and vaccination intentions, the decision was made to use the full sample size of 226 for the test of hypothesis 6.

Table 1.
Factor loadings for the media influence items

Media Influence Items.	Factor loading	Factor loading	Mean (SD)

	(Factor 1)	(Factor 2)	
1. Seeing the Gardasil commercials on TV make me feel like I shouldn't get the vaccine.	.886	-.070	4.11 (1.68)
2. Seeing the Gardasil advertisements in magazines make me feel like I shouldn't get the vaccine.	.921	-.092	4.34 (1.68)
3. Seeing the Gardasil advertisements in other print media makes me feel like I shouldn't get the vaccine.	.918	-.077	4.31 (1.70)
4. I feel like HPV is not a concern for me because of the Gardasil commercials on TV.	.918	-.036	4.09 (1.72)
5. The information that I learned about Gardasil on the Internet makes me not want to get the vaccine.	.896	-.102	4.25 (1.72)
6. The information that I learned about Gardasil on the news makes me not want to get the vaccine.	.911	-.133	4.22 (1.76)
7. I value what the Gardasil commercials on TV have to say.	.849	.007	4.04 (1.75)
8. The Gardasil commercials on TV are very informative to me.	.839	.023	3.99 (1.76)
9. How often do you use the Internet for health information?	.055	.607	2.89 (1.26)
10. How often do you use the Television for health information?	-.023	.895	1.87 (1.00)
11. How often do you use the Radio for health information?	-.226	.747	1.50 (0.87)

Hypothesis 6: Theory of Planned Behavior Model for Predicting HPV Vaccination

Exploratory Factor Analysis

To estimate the latent constructs in the structural equation model, indicators were created from the scale items presented in the methods section. Exploratory factor analyses were performed on all scales in this study to eliminate flawed items. Principal components analysis was utilized as an extraction technique, and varimax rotation was performed as a rotation technique. The decision was made to retain items with factor loadings above .60.

The attitudes towards vaccination measured loaded onto a single factor [eigenvalue = 3.70, R^2 = .62; α = .87]; as such, all 6 items were retained in estimating the latent construct of attitudes towards HPV vaccination (Table 2).

Table 2.

Factor loadings for the attitudes towards HPV vaccine items.

Attitudes towards HPV vaccine items.	Factor loading	Mean (SD)
1. The HPV vaccine might cause short-term problems, like fever or discomfort.	.753	3.80 (1.21)
2. The HPV vaccine is being pushed to make money for drug companies.	.832	3.48 (1.49)
3. The HPV vaccine might cause lasting health problems.	.825	3.77 (1.36)
4. If a teenage girl gets the HPV vaccine, she may be more likely to have sex.	.774	3.28 (1.58)
5 I think the HPV vaccine is unsafe.	.787	3.53 (1.54)
6. Adolescent girls are too young to get a vaccine for sexually transmitted infections, like HPV.	.737	2.90 (1.58)

The behavioral beliefs measure was submitted to factor analysis and revealed that 1 item loaded onto a separate factor; this item was subsequently removed from analysis, leaving a 4-

item measure of behavioral beliefs [eigenvalue = 2.65, R^2 = .53; α = .80]. See Table 3 for the factor loadings of these items. A strikethrough indicates that that respective item was deleted.

Table 3.

Factor loadings for the behavioral beliefs items

Behavioral Beliefs Items.	Factor loading (Factor 1)	Factor loading (Factor 2)	Mean (SD)
1. The Gardasil vaccine would be a good health decision on my part.	.775	.180	3.26 (0.88)
2. Getting the Gardasil vaccine would protect my future sex partners from HPV.	.798	.037	3.37 (0.98)
3. Getting the Gardasil vaccine would help me to learn more about sexually transmitted infections.	.734	.128	3.26 (0.96)
~~4. The Gardasil vaccine would make me feel uncomfortable.~~	~~.155~~	~~.984~~	3.16 (1.01)
5. Getting the Gardasil vaccine would help me to be healthier.	.808	.174	3.20 (0.90)

An identical factor analysis was performed on the perceived norms items, which loaded onto three factors with an eigenvalue ≥ 1. The second and third factors had multiple items cross-loading onto one another, suggesting that these items may be potentially poorly worded or uncorrelated with other items in the scale; those items were removed from analysis. This resulted in a 4-item measure that clearly loaded onto one factor to estimate the latent construct of perceived norms [eigenvalue = 2.89, R^2= .72; α = .87] Table 4 indicates the factor loadings for the norms measure.

Table 4.

Factor loadings for the perceived norms items.

Perceived Norms Items.	Factor loading (Factor 1)	Factor loading (Factor 2)	Factor loading (Factor 3)	Mean (SD)
1. My mother would think it would be a good idea to receive the Gardasil vaccine.	.888	.006	-.004	3.16 (0.98)
2. My father would think it would be a good idea to receive the Gardasil vaccine.	.857	-.087	.120	3.14 (0.91)
3. My parent would think it would be a good idea to receive the Gardasil vaccine.	.891	-.132	.090	3.19 (0.91)
~~4. I think my friends would support my getting the Gardasil vaccine.~~	~~.557~~	~~-.482~~	~~.143~~	3.20 (0.85)
~~5. I think that Gardasil is just for girls. In general, I think that the people of Virginia would not support me getting the Gardasil vaccine.~~	~~-.030~~	~~.848~~	~~.011~~	2.77 (0.90)
~~6. People who are important to me would not support me in getting the Gardasil vaccine.~~	~~-.558~~	~~.542~~	~~.204~~	2.62 (0.92)
~~7. I know other men who have received the Gardasil vaccine.~~	~~.019~~	~~.312~~	~~.815~~	2.26 (1.01)
8. The people whose opinions I value most would think it is a good idea for me to get the Gardasil vaccine	.613	-.363	.269	3.07 (0.95)
~~9. I value what the Gardasil commercials on~~	~~.185~~	~~-.364~~	~~.763~~	2.78 (0.86)

~~television tell me.~~				

The 3-item measure for motivations to comply with norms were next entered into a factor analysis, and the 3 items clearly loaded onto the one factor. As such, all 3 items were retained to estimate motivations to comply with norms [eigenvalue = 2.46, R^2 = .49; α = .85] Table 5 shows the factor loadings and items for this measure.

Table 5.

Factor loadings for the motivations to comply with norms items.

Motivations to comply with norms items.	Factor loading (Factor 1)	Factor loading (Factor 2)	Mean (SD)
1. How much do you value your parents' opinion in your decision to get the Gardasil vaccine?	.880	-.032	2.93 (1.41)
2. How much do you value your friends' opinion in your decision to get the Gardasil vaccine?	.912	-.026	3.18 (1.34)
3. How much do you value the internet's opinion in your decision to get the Gardasil vaccine?	.829	.254	2.75 (1.23)

The final factor analysis examined the measure of perceived behavioral control. Dimension reduction revealed that 2 items loaded onto a second factor, and those items were subsequently removed from analysis, leaving 6 items (Table 6) to estimate the latent construct of perceived behavioral control [eigenvalue = 2.68, R^2 = .54; α = .78].

Table 6.

Factor loadings for the perceived behavioral control items.

Perceived Behavioral Control	Factor loading (Factor 1)	Factor loading (Factor 2)	Mean (SD)

1. Getting the Gardasil vaccine would be easy for me.	.718	.232	3.21 (0.93)
2. It would be a good idea to get the Gardasil vaccine.	.622	.364	3.14 (0.85)
3. Whether or not I get the Gardasil vaccine is completely up to me.	.704	-.149	3.93 (1.13)
4. If I really wanted to, I know I could get the Gardasil vaccine.	.744	.129	3.63 (1.05)
~~5. It is expected that I get the Gardasil vaccine.~~	~~.078~~	~~.784~~	2.47 (0.93)
~~6. I will make an effort to get the Gardasil vaccine~~	~~.031~~	~~.808~~	2.67 (0.95)
7. It would be difficult for me to get the Gardasil vaccine.	.631	-.213	2.43 (0.93)
8. I am confident I can find a place to receive the Gardasil vaccine.	.804	.148	3.53 (1.02)

Control beliefs loaded onto one factor [eigenvalue = 1.63, R^2 = .54; Table 7], but did not have adequate Cronbach's alpha values (α = .58), and were removed from further analysis. Even though control beliefs (which are theoretically part of the construct of perceived behavioral control) were not adequately measured in this study, it is worth noting that many tests of the TPB often substitute self-efficacy for perceived behavioral control (Gerend & Shepherd, 2012).

Table 7.

Factor loadings for the perceived controllability items.

Perceived Controllability	Factor loading	Mean (SD)
1. Unanticipated events would make it unlikely for me to get the Gardasil vaccine.	.634	2.94 (0.91)
2. If I didn't feel well, I would make it more difficult to get the Gardasil vaccine.	.785	3.08 (0.89)

3. If my job or coursework put too many demands on my time, it would make it difficult for me to get the Gardasil vaccine.	.785	3.15 (0.96)

The means and standard deviations for all final scales are shown in Table 8.

Table 8.

Means and standard deviations of all constructs measured.

Construct	**Mean (SD)**
Media Beliefs	39.61 (12.23)
Attitudes Towards HPV	20.75 (6.88)
Behavioral Beliefs	10.91 (2.92)
Perceived Norms	12.55 (3.18)
MTC Norms	8.86 (3.50)
Perceived Behavioral Control	19.88 (3.37)

Structural Equation Model

Structural equation modeling was performed using maximum likelihood estimation to test the overall fit of attitudes towards HPV vaccination, HPV vaccination norms, and perceived behavioral control over HPV vaccination as predictors of HPV vaccination intentions. Structural equation modeling allows a researcher to compare a tested model's observed variance/covariance matrix to an implied variance/covariance matrix (e.g., the theory of planned behavior model), which allows for a test of how well the theoretical model fits the given data. Results from the structural equation model are presented in Figure 4.

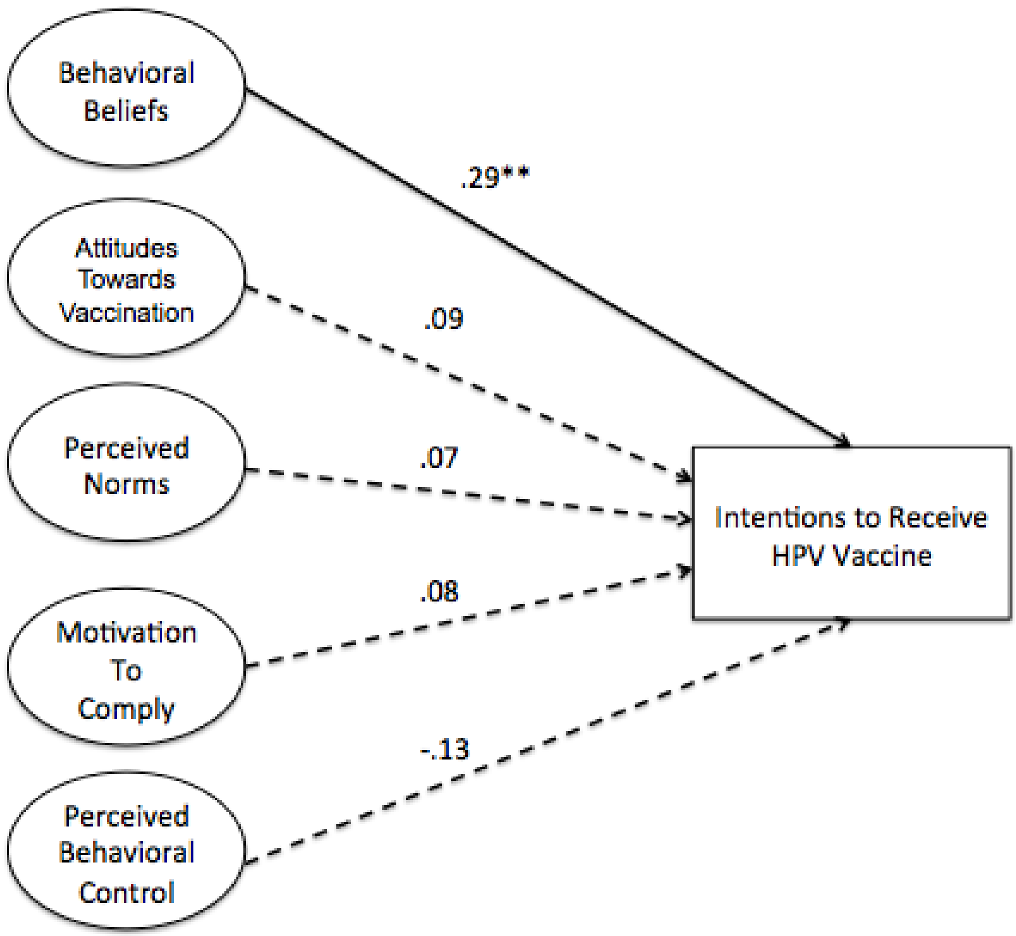

Figure 4. Structural equation model of the theory of planned behavior

To understand the unique impact of the separate TPB constructs (e.g., behavioral beliefs vs. general attitudes), separate latent constructs were estimated for each, and were correlated with each other in the final model. The data were not multivariate normal (*Mardia's coefficient* = 131.76 ≥ 31.08), however as a Bollen – Stine bootstrap procedure was performed, this non-normality should not bias the results of the structural equation model. The model provided adequate overall fit to the data [Bollen - Stine χ^2 = 341.30, df = 195, *p* = .02, *CFI* = .934, *TLI* = .922, *RMSEA* = .057]. The significant χ^2 value indicates a misspecification in the comparison of the observed and reproduced variance/covariance matrix. However, the CFI and TLI values were both above .90, with an RMSEA confidence interval containing a lower end value less than .05 (90% *RMSEA* CI: .047, .066). Considering these fit statistics, we argue that the TPB provides an adequate overall fit to the data. The model indicated many significant correlations among the latent predictors of HPV vaccination intentions. These correlations are presented in Table 9.

Table 9.

Correlations among the latent constructs.

Latent Construct	BehBeliefs	Attitudes	Norms	MTC	PBC
1. BehBeliefs	1				
2. Attitudes	-.09	1			
3. Norms	.62***	-.18*	1		
4. MTC	.18*	-.10	.07	1	
5. PBC	.38***	-.14	.36***	.08	1

Standardized covariance estimates among latent predictors in the model
Note: BehBeliefs = Behavioral beliefs, MTC = Motivations to comply with norms, PBC = Perceived behavioral control
N = 235. *$p < .05$, ***$p < .001$

There were significant correlations between norms and behavioral beliefs, indicating that those who perceived greater social norms towards HPV vaccination were more likely to feel that vaccination would produce a beneficial outcome ($r = .62$, $p < .001$). Norms were also negatively correlated with attitudes towards HPV vaccination, suggesting that those who had negative attitudes towards HPV vaccination perceived HPV vaccination as less normative ($r = -.18$, $p =$

.02). Motivations to comply with norms did not correlate with perceived norms (r = .07, p = .37), supporting the notion that norms and motivations to comply with those norms are separate constructs. However, motivations to comply with norms were positively associated with behavioral beliefs (r = .18, p = .02). This indicates that that those who value norms about HPV vaccination may in turn believe that vaccination will produce a favorable outcome for them.

In the final model, perceived behavioral control was not associated with intentions to vaccinate with the HPV vaccine; perceived behavioral control was, however, positively associated with both behavioral beliefs (r = .38, p < .001) and perceived norms (r = .36, p < .001). These results indicate that those who perceived greater social norms towards HPV vaccination were also more likely to see vaccination as more normative. With the full model being estimated with adequate fit, the parameters indicate that the sole predictor of intentions to receive the HPV vaccine in the next 6 months was behavioral beliefs [β = .288, p = .005].

Exploratory Analyses: HPV vaccination

Exploratory analyses were performed to examine demographic differences in those who have received the HPV vaccine. Out of the 267 participants who completed the survey, 26 (9.7%) stated that they received the HPV vaccine when asked the question "Have you ever received the Gardasil vaccine?"

A chi-square analysis was performed to examine if there were racial differences in those who received the HPV vaccine, for which there were no differences observed χ^2 = 5.64, df = 4, p = .23. Furthermore, gay and bisexual men did not differ from heterosexual men in terms of having already received the HPV vaccine χ^2 = 0.49, df = 2, p = .78. When relationship status was submitted to a chi-square analysis, no differences emerged between persons in a relationship or single, χ^2 = 2.02, df = 3, p = .57. An additional question that simply asked "Are you sexually active?" was used in a chi-square analysis to examine differences between having been vaccinated with Gardasil or not, to which no differences emerged, χ^2 = 0.83, df = 2, *p* = .66. An exploratory question asked participants if any person in their family had ever had cancer, with 56.9% indicated "yes", 32.6% indicating "no", 10.5% indicating "do not know". Those who indicated a family history of cancer were significantly more likely to report having received the HPV vaccine (13.8%) than those who did not report such family history (5.7%), χ^2 = 7.47, *df* = 2, *p* = .02, in addition to indicating "false" on a question that stated "HPV is a woman's disease" (response options were true, false, or don't know), χ^2 = 11.07, df = 4, *p* = .03. The question examining HPV as a woman's disease, however, was unrelated to intentions to receive the HPV vaccine among the unvaccinated, *F*(2,264) = 0.82, p = .92.

Discussion

The present study was the first to my knowledge to test the TPB in relation to male HPV vaccination with all of its correct theoretical predictors. Result from this study furthers the understanding of male intention to receive the HPV vaccine.

Hypothesis 1: Normality

The first hypothesis examined the normality of vaccination intentions. Given that HPV vaccination is relatively new for men, there are concerns that there may be a lack of normality in intentions to receive the HPV vaccine. Results from this study showed that the HPV vaccination item was normally distributed, and furthermore provide support for past research which has found significant results while using similar HPV vaccination items (Reiter et al., 2011; Daley et al., 2011; Daley et al., 2010).

Hypothesis 2: Race

The second hypothesis sought to examine racial variability in intentions to receive the HPV vaccine. The test results suggest that the only difference observed was between white and "other" races. With only 6.4% of the sample identifying as "Other" race, these differences are difficult to interpret. Pragmatically, they mean that those who identified as "Other" had greater intentions towards receiving the HPV vaccine than whites. This means that those who may be mixed race or identify as an unmeasured race in this study have greater intentions towards receive the HPV vaccine in the next 6 months.

Research has documented what is called the "White male effect" (Finucane, Slovic, Flynn, & Satterfield, 2000), which posits that White males tend to perceive their subjective risk as lower than that of non-whites. This "White male effect" defines risk perception more generally, but can be applied to the results herein. While there were no differences in HPV vaccination intentions among the other races measured (e.g., African-American, Hispanic, Asian-American), the differences between Whites and "other" races may support the White male effect in this instance.

Hypothesis 3: Sexual Orientation

The third hypothesis was to examine differences in vaccination intentions as a function of sexual orientation. Past research suggests that gay and bisexual men have more positive attitudes towards the HPV vaccine (Gilbert et al., 2011b), and greater knowledge about HPV, as well as greater perceived likelihood of contracting HPV (Gilbert et al., 2011b). Results from this sample do not support the hypothesis that there are differences in vaccination intentions between sexual orientation groups. While gay and bisexual men had slightly higher means than heterosexual men, these means were not statistically different from the means of the heterosexuals in this sample. These results should be interpreted cautiously due to a low variability in sexual orientation in our sample. Only 8% of our unvaccinated sample identified as gay or bisexual, and with the large number of individuals identifying as straight, there may not have been enough power to detect differences in intention to receive the HPV vaccine.

To further investigate this issue of small variability in sexual orientation, the Cohen's *d* values indicated that the difference between bisexual and heterosexual men indicated a small effect (.42 > .2), which suggests that bisexual men may have greater intentions to receive the HPV vaccine when compared to heterosexual men. The effect size for the differences between gay and heterosexual men did not reach the threshold of .2, so the assumption remains that gay men and straight men are similar in their intentions to receive the HPV vaccine. When gay and bisexual men were combined into one category, there was a small effect of the mean difference between the two groups (d = .34), resulting in non-heterosexuals (gay and bisexual men) potentially having greater intentions to receive the HPV vaccine when we consider the effect size.

Hypothesis 4: Sexual Behavior

Past research has shown that having more sexual partners is associated with greater willingness to receive the HPV vaccine, and a greater acceptance of that vaccine (Gerend et al., 2008; Jones & Cook, 2008; Ferris et al., 2009). No past research to our knowledge has examined how sexual behavior is associated with intentions to receive the HPV vaccine. However, past research has identified positive relationships between sexual behavior and *willingness* to receive the vaccine, as well as *acceptance* of the vaccine. Results from the present study showed that the spearman's rho correlation between the number of sexual partners in the past 3 months and HPV vaccination intentions was not statistically significant. Furthermore, our exploratory analysis that examined if sexually active individuals were significantly more likely to already have received the vaccine was not significant. Given that acceptance and willingness to receive the HPV vaccine may be a completely separate construct from actual intention to receive the vaccine could explain this non-significant result. However, it would be reasonable to assume that willingness and acceptance would be highly correlated. Given that intentions involve a specific behavioral component, intentions may represent a conceptual departure from constructs like acceptance and willingness to receive the vaccine. As multiple studies have established a relationship between sexual behavior and HPV vaccine willingness/acceptance, the remaining explanation could be that men who have greater sexual partners may very well be willing to receive the HPV vaccine, and think that getting the vaccine is acceptable, but may not actually want to put the effort into getting the vaccine for themselves.

This result provides fruitful areas for future research, as there may be many different statistical results when framing questions about HPV vaccination intention. Whether or not someone accepts a vaccine, or is willing to receive it, may *not* indicate that they are intending to receive the vaccine. Intentions require an active action on the part of the behavioral agent (the individual), and may therefore be a different construct.

Hypothesis 5: Media influence

The research examining media influence on HPV vaccination intentions in males is scarce. Results from the present study suggest that both influence from HPV commercials, as well as using media for health information, were uncorrelated with intentions to receive the HPV vaccine. DiClemente and colleagues (2011) provided initial support for this hypothesis when their experiment on media influence indicated that any type of media advertisement targeting men increased male intentions to receive the HPV vaccine. This could bolster the argument that HPV vaccination may be more normative now, and that men may no longer see the HPV vaccine as a “Women’s issue” as a result of media advertisements heavily focusing on women. However, more recent advertisements have been geared towards men and participants in this study may have been exposed to those.

Hypothesis 6: TPB Model

Using our combination of CHIAS measures (McRee et al., 2010) and items modeled after a sample TPB survey (Ajzen, 2012), the TPB provided an adequate fit to the data. One curious finding that arose in examining the correlations among the latent constructs in the model was that perceived behavioral control was correlated with perceived norms and behavioral beliefs in such a way that suggests greater belief that getting the HPV vaccine would produce favorable outcomes, along with greater perceived norms towards receiving the HPV vaccine, were associated with greater perceived ability to receive the HPV vaccine. These relationships are all in the expected directions. Of note is the especially strong relationship between behavioral beliefs and perceived norms. The beta coefficient was .62 ($p < .001$), suggesting that men who perceive greater norms of HPV vaccination are more likely to believe that it is beneficial for them to receive the vaccine.

Other interesting results from the correlations among the TPB predictors illustrate that norms and behavioral beliefs are highly correlated. This illustrates that norms and behavioral beliefs may affect each other, such that those who perceive HPV vaccination as more normative may also believe that HPV vaccination will produce favorable outcomes, or vise-versa. A weak relationship was found between norms and attitudes, suggesting that those with greater perceived HPV vaccination norms had less negative attitudes towards HPV vaccination. Moreover, an equally weak relationship was found between motivations to comply with norms and behavioral beliefs, suggesting that those who value social norms in general are more likely to believe HPV vaccination will produce a favorable outcome for them.

The model illustrated that the sole predictor of intentions to receive the HPV vaccine was behavioral beliefs. Again, behavioral beliefs represent the idea that engaging in a behavior (in this case, vaccination with the HPV vaccine) will produce a favorable given outcomes (e.g., protecting other partners, making oneself more healthy, etc.). This would indicate that the most powerful predictor of whether a male vaccinates with the HPV vaccine would be whether he believes doing so would be a good idea for his personal health. While surprising that no other predictors on the TPB model were significant, it may make sense given that this sample contained all men. Men are often not the targets of HPV vaccine advertisements, and the CDC has only recently recommended that men receive the vaccine. As such, perceived norms towards male vaccination may simply not be established yet among this sample. As a potential result of this, motivations to comply with norms were also not a significant predictor of intentions to receive the HPV vaccine. Attitudes toward HPV vaccination were measured using a previously validated measure (the CHIAS; McRee et al., 2010), which theoretically mapped onto attitudes towards HPV vaccination. This relationship between attitudes towards HPV vaccination and intentions to receive the HPV vaccine was not significant, which may illustrate that men simply may not utilize how they feel about the HPV vaccine when making judgments as to whether or not they will receive the vaccine. Interestingly enough, Gerend & Shepherd (2012) found the exact same beta coefficient for attitudes towards vaccination in their SEM model of the TPB with women [$\beta = .09$, $p < .05$], which may suggest that there is an effect of attitudes on vaccination intentions, but our sample size precluded us from detecting it. Alternatively, men may see behaviors like vaccination as generally necessary and may not care about whether or not they have negative attitudes towards this specific health behavior.

The final construct of the TPB model that did not significantly predict HPV vaccination intentions was perceived behavioral control. It may at first remain relatively puzzling that this factor did not predict HPV vaccination intentions, especially as perceived behavioral control tends to be among the strongest predictors in most TPB models (e.g., Gerend & Shepherd, 2012; Norman & Cooper, 2011). A study by Crosby and colleagues (2011) found that self-efficacy to be vaccinated with the HPV vaccine was not predictive of intentions to receive the vaccine. Furthermore, a study by Hernandez and colleagues (2010) included a variable in their analysis of male HPV vaccination intentions that asked participants whether transportation to a clinic to receive the vaccine would influence intentions; this also was not significant in their final analysis. Along with the results of the present study, it may suggest that perceived behavioral control may not be a crucial factor in predicting HPV vaccination intentions among men. The TPB argues that whether or not an individual engages in a health behavior is dependent on whether one believes one is able to engage in that behavior (Ajzen, 2002). The alternative explanation would be that whether or not a man believes he is able to get the HPV vaccine is irrelevant in the subsequent intentions to receive the HPV vaccine. The perception of vaccination may be different from that of other health behaviors, like quitting smoking or negotiating safer sex. Receiving the HPV vaccine may be perceived as relatively easy, and so an immense amount of self-efficacy may not be needed to actually intend to receive it.

Exploratory analyses

Our exploratory analyses were performed to examine demographic factors that were associated with having already received the HPV vaccine. These results suggest that no one demographic factor predicted HPV vaccination: sexual orientation, race, sexual activity, and relationship status. The sole demographic factor that was predictive of HPV vaccination was having a family history of cancer. This result ties in well with the results of the structural equation model, which suggests that behavioral beliefs are the sole predictor of HPV vaccination intentions. Those who have a family history of cancer may be high in the behavioral belief that vaccination will benefit them, because the perceived threat of them getting cancer at some point in the future is high.

Previous research on family histories of cancer has illustrated that women with a family history of cancer are more likely to receive a pap test (Williams, Reiter, Mabiso, Maurer, & Paskett, 2009). In this study, just having a family history of cancer was powerful enough for these women to receive a pap test, which is important for HPV detection. A similar finding was found in a male sample for prostate, colorectal, and skin cancer screenings. Shah and colleagues (2007) found that men who had a family history of prostate, colorectal, and skin cancer were significantly more likely to report receiving an examination coinciding with their family history; these results were stronger for young men.

Past research shows that there is a powerful impact of having a family history of cancer in terms of engaging in preventative measures to reduce the risk of cancer. Much in the same way, our data support these studies by showing that young men with a family history of cancer were more likely to report receiving the HPV vaccine. These vaccination behaviors could be potentially due to a doctor's suggestion, or increased knowledge about HPV. The latter may be true given that men in this study who had a family history of cancer were also significantly more likely to indicate "false" on a question that stated "HPV is a woman's disease", suggesting that those who have been vaccinated may be more knowledgeable about male HPV risks.

Limitations

The present study had several limitations. Of these were cross-sectional data precluding any ability at causal inference. Secondly, the data presented in this study did not actually record whether or not participants received the HPV vaccine at a later time, which may have very well occurred and limits the full examination of the TPB model.

One major limitation in this study was that testing the TPB requires the researcher to create items to test the appropriate constructs. As such, the items used to test the most of the TPB model were created for the purpose of testing the TPB model. To make this process more stringent and nested within past studies, we often looked to past research to find appropriate constructs (e.g., using the CHIAS to estimate some constructs of the TPB, and a sample questionnaire). While EFA was performed to retain the best fitting items, it could be argued that a sample-specific model was fit and estimated based on EFA item retention.

While that may be true when estimating factor fit per construct (e.g., perceived norms, attitudes towards vaccination separately), it is not entirely plausible when testing the full theoretical model. This is due to items not being deleted based on poor factor loading when testing the *full* structural equation model, but when estimating each individual factor. As items were not retained to maximize the final model fit in the final model, but were deleted while performing a factor analysis on each individual construct before testing the final model, it provides a relatively stringent way of testing model fit in a single cross-sectional sample.

This study employed a relatively small sample size. Through factor analysis we eliminated poorly fitting items, which reduced needless parameter estimates, and improved power. Moreover, the use of a Bollen – Stine bootstrapping technique corrects for small sample size and non-normality, which should eliminate any negative impact of a small sample size when testing the full model.

The model that we posit only had adequate fit, as the RMSEA value was greater than .05. The chi-square statistic was significant, indicating a significant misspecification of the observed and reproduced variance/covariance matrix. Furthermore, the CFI and TLI values were above .90, but less than .95, which indicate adequate fit. Finally, the RMSEA value was greater than the suggested .05 cutoff value. However, since the 90% confidence interval contained .05 as an estimate of model fit, it is presumptuous to reject the model altogether.

The data from the current sample were derived from a majority (50.6%) white sample, which may preclude extrapolation of interpretation beyond this group. Post hoc analysis revealed that there were no significant differences between whites and non-whites in their intentions to receive the HPV vaccine in the next 6 months.

General Implications

While this study had limitations, it also provides insight into how the TPB fits when predicting college-aged male’s HPV vaccination intentions. An implication of the present study is that theoretical models may not work best when predicting health behaviors (e.g., vaccination) which may not be viewed as necessary or essential by certain groups (e.g., men); therefore, testing theoretical models may not provide the best predictors of behavior in populations who do not see themselves at risk. Future studies should consider performing comparisons of theoretical models of HPV vaccination between genders. As found by Gerend and Shepherd (2011), the TPB was a fitting model for predicting HPV vaccination intentions for female participants, outperforming the HBM in terms of model fit. The present research suggests that males may be different from females in terms of how they decide on whether or not to receive the HPV vaccine. As such, a specific avenue for future research would be to test and compare models of behavior change (e.g., TPB, HBM, transtheoretical model) and see how, alone or in combination, these models better predict HPV vaccination.

Some have argued that the TPB assumes that the individual is an informed agent of their own behavior change. Other TPB examples may highlight weight loss or beginning an exercise regimen as a health behavior to measure, however those health behaviors are commonly taken up across genders, and one could assume that participants would know that exercise or weight loss might benefit them regardless of their individual gender. In the instance of HPV, men may not be acting as informed agents, and therefore only behavioral beliefs remained as a predictor of HPV vaccination intentions in my sample. In other words, if men do not see themselves at risk for HPV, then the TPB model may provide an adequate model of predicting behavioral intentions. This highlights the importance of behavioral beliefs in predicting male HPV vaccination intentions, and provides important information to physicians and interventionists attempting to increase HPV vaccination among males, by emphasizing the health benefits of HPV vaccination.

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Vita

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