

**INTENT TO RECEIVE AN HPV VACCINE AMONG UNIVERSITY MEN
AND WOMEN AND IMPLICATIONS FOR VACCINE ADMINISTRATION**

by

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Abstract

Objective: An effective human papillomavirus (HPV) vaccine must be accepted by young persons in order to achieve its full public health benefits. This study examines the intention to receive an HPV vaccine among college age men and women.

Methods Summary: 340 university students, 138 men and 202 women, ages 18 to 32 (mean age of 20.8) completed self-administered questionnaires. Intention was measured by asking participants how likely they would be to accept an HPV vaccine that prevented 1) all HPV, 2), cervical cancer but not genital warts, 3), warts but not cancer, or 4) both warts and cancer.

Results: Both men and women reported high intent to receive an HPV vaccine, though women significantly more so, 77.5% and 88.6% respectively ($p < .01$). Men were less willing to receive a vaccine that prevents cervical cancer in women (men can transmit HPV to their sexual partners) compared to one that prevents cervical cancer and genital warts (34.1% vs. 77.5%, $p < .001$). Intent to receive the HPV vaccine was significantly greater among participants having more than five partners compared to those having no partners (OR = 4.4; 95% CI = 1.4, 14.4). Intent was also significantly greater among those answering two or three HPV knowledge questions correctly compared to those getting none or only one question correct (OR = 3.6; 95% CI = 1.3, 9.9).

Conclusions: A great majority of university students in this study were willing to receive the vaccine. Interest varied according to sexual history and knowledge about HPV, and in men, according to whether the vaccine targeted genital warts.

Public Health Significance: An effective HPV vaccine, and one that is accepted, could have enormous public health benefits as vaccinations are one of the most successful public health approaches to preventing and controlling many infectious diseases.

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PREFACE

An article based on this thesis research project has been accepted for publication in the *Journal of American College Health*, copyright by Heldref Publications.

1.0 INTRODUCTION

Human papillomavirus (HPV) is one of the most pervasive sexually transmitted diseases (STDs) in the United States as 20 million people are currently infected with HPV and an estimated 6.2 million Americans will acquire a new HPV infection each year (Centers for Disease Control and Prevention [CDC], 2006a). Of the estimated 15.4 million new cases of STDs in the United States prior to 1996, HPV made up the largest portion with 5.5 million cases (Burk et al., 1996). Epidemiologic studies suggest that 75% of all people who are sexually active will become infected with HPV at some point in their lives (Koutsky, 1997). An estimated 50% of all reported cases of STDs are among people 15 to 24 years of age (Weinstock, Berman, & Cates, 2000) and the highest rate of HPV infection are among adults ages 18 to 28 (Koutsky, 1997). Although less is known about HPV among men, research suggests that levels of current infections in men appear to be similar to the levels in women (CDC, 1999). HPV infection tends to be transient, asymptomatic and causing no clinical problems, but may manifest as genital warts in both men and women, or cervical cancer in women. Approximately 1% of the sexually active population in the U.S. aged 15 to 49 has genital warts (Koutsky, Galloway, & Holmes, 1988) while research in both the U.S. and Europe suggests that the highest incidence of genital warts is among men and women 20 to 24 years of age (Chuang, Perry, Kurland, & Ilstrup, 1984; Persson & Krantz, 1996; Simms & Fairley, 1997). Approximately 500,000 new cases of cervical cancer occur each year worldwide, 260,000 of which are fatal (CDC, 2006b). In the U.S., it is

estimated that there were over 9,700 cases of cervical cancer in 2006, and of these 3,700 resulted in deaths (American Cancer Society [ACS], 2005; CDC, 2006b).

Vaccinations are one of the most successful public health approaches to preventing and controlling many infectious diseases. At the end of 2005 Merck and GlaxoSmithKline each announced that its experimental HPV vaccine, Gardasil and Cervarix respectively, were 100% effective in preventing the infection of HPV strains 16 and 18 in women over five years time, which together cause about 70% of cervical cancers. Merck also announced that Gardasil was 99% effective in preventing HPV strains 6 and 11, which together cause about 90% of genital warts (Kaiser Family Foundation, 2006). Determining the acceptability of the HPV vaccine is very important as HPV is a sexually transmitted disease that is not only detected in almost 100% of cervical cancers worldwide (Walboomers, et al., 1999) but also strains of the virus have been linked to 70% of anal cancers and 70% of precancerous lesions of the penis (Geipert, 2005). A goal of Healthy People 2010, objective 25-5, is to decrease the number of HPV infections (U.S. Dept of Health and Human Services, 2000). An effective HPV vaccine, and one that is accepted, could have enormous public health benefits for both men and women by decreasing the morbidity and mortality associated with cervical, anal, and penile cancers, which may translate into enormous savings in healthcare costs as well as the emotional and financial costs associated with cancer and genital warts.

Previous research on the acceptability of an HPV vaccine has focused primarily on adolescent females and parental views of these adolescent females receiving the vaccine. Results have shown that a large proportion of females studied, as well as parents of adolescent females, would accept an HPV vaccine were it available (Boehner, Howe, Bernstein, & Rosenthal, 2003; Hoover, Carfioli, & Moench, 2000; Kahn, Rosenthal, Hamann, & Bernstein, 2003; Mays,

Sturm, & Zimet, 2004; Olshen, Woods, Austin, Luskin, & Bauchner, 2005; Zimet, Mays, Winston, et al., 2000; Zimet, et al., 2005). The CDC's Advisory Committee on Immunization Practices (ACIP) recommends the vaccine for girls as young as age nine, and it also recommends the vaccine for females up to age 26 (Kaiser Family Foundation, 2006). The upper age limit was set because at the time of this study the vaccine has only been tested in females up to age 26. Though the vaccine will be most effective if received before the onset of sexual activity, vaccination is recommended for those already sexually active as well, regardless of a previous history of HPV infection or an abnormal Pap test, as there do not appear to be any adverse effects in vaccinating women with prior infection and because women infected with one type of HPV are still at risk for infection with other types.

Research has found that college women (ages 18 to 23) have a greater risk of acquiring STDs than the general population because of the high-risk sexual behaviors in which they engage (Burak & Meyer, 1997) and one study found that as many as 60% of college-age women had some strain of HPV (Alvey, 1995). Thus, it is very important to understand how college age individuals view the vaccine since they are at the age when they, not their parents, will need to make the decision to get the vaccine. A study by Mays, Sturm, and Zimet (2004) found that 32 of the 34 parents they surveyed expected their child to make his/her own decision regarding vaccination by age 18. Vaccine acceptability among older adolescents and young adults is also important as vaccine distribution will need to play catch up in the first few years and target older individuals as well. College health services will need to consider methods to get the vaccine to students, many of whom do not have traditional health insurance.

To date recommendations for use focus on women. National vaccine recommendations have not yet been made for men, but research on the efficacy of the vaccine in males has recently

begun. The safety and efficacy of the HPV vaccine have recently been established for males aged 9 to 15 years, though additional clinical trials are still needed (Friedman, Kahn, Middleman, Rosenthal, & Zimet, 2006).

Understanding men's views of the vaccine and how these compare to women's is crucial to the elimination of cervical, penile, and anal cancers, as well as genital warts. Little prior research has examined men's intent to receive an HPV vaccine compared to women's. Focusing on women only sends the message to both men and women that prevention of HPV is exclusively a woman's problem. Men play a considerable role in the transmission of HPV as findings reveal that men with HPV report significantly more sex partners than those without the infection and women who have had at least one new partner since their last visit to the clinic were at an increased risk for HPV if their partners had multiple partners (Hippelainen, et al., 1993; Ho, Beirman, Beardsley, Change, & Burk, 1998). Therefore, the willingness of men to receive the vaccine is important not only for the men themselves, but also may have an indirect health benefit for women by significantly decreasing their risk of acquiring HPV.

Studies by Bosch et al. (1996) and Burk et al. (1996) conducted with married couples showed that risk for cervical cancer is strongly associated with the number of partners a woman's husband has had, as well as the number of past partners of the woman herself. Researchers found an increased risk of cervical cancer in female partners of men infected with HPV (Bosch, et al., 1996; Hippelainen, et al., 1994; Zunzunegui, King, Coria, & Charlet, 1986). Clustering has been found of female and male genital cancers as well as an increased risk of cervical cancer among wives of men with penile cancer whose previous wife died of cervical cancer, and of men with a high number of sexual partners (Agarwal, Sehgal, Sardana, Kumar, & Luthra, 1993; Brinton, et al., 1989; Buckley, Harris, Doll, Vessey, & Williams, et al., 1981;

Pridan & Lilienfeld, 1971; Slattery, et al., 1989; Thomas , et al., 1996; Zunzunegui, King, Coria, & Charlet, 1986).

Men often have more partners and due to the lack of testing and the absence of symptoms they often do not know they have the infection (Hippelainen, et al., 1993). Vaccinating both genders would prevent the transmission of the virus between men and women as well as prevent placing the issue solely in women's hands.

The vaccine's target diseases (i.e., cervical cancer, or genital warts and cervical cancer) and which target diseases are emphasized when promoting the vaccine are important to examine as this may determine the acceptability of the vaccine by gender. An HPV vaccine that is marketed as preventing both cervical cancer and genital warts may be better received among young men, thus increasing its use among both sexes. Lastly, knowledge about HPV may vary by gender, greatly affecting interest in the vaccine.

1.1 HPV INFECTION

Over 30 strains of HPV exist that infect the genital area and are spread by skin-to-skin contact during sex (Daley, 1998; International Agency for Research on Cancer [IARC], 1995; Koutsky, 1997). Genital HPV infections are categorized by their association with cervical cancer. Two HPV strains, types 6 and 11, categorized as low-risk types, can cause benign cervical cell changes and cause nearly all male and female genital wart infections. Approximately 20 HPV strains can cause cervical cancer in women; four are accountable for the majority of cases, known as high-risk types. Types 16 and 18 together cause about 70% of cervical cancer, and Types 31 and 45 together cause another 15% (IARC, 1995). Infection with high-risk HPV is

also associated with the growth of other malignancies including oral, vulvar, penile, and anal cancers (Castle, et al., 2004; Daling, et al., 2004; Gilson & Lowy, 2004). Frisch found that about 90% of anal cancers among women, 58% among heterosexual men, and 100% among homosexual men were positive for high-risk HPV DNA (Frisch, 2002). The association of HPV of the genitals with non-genital cancers (i.e., head, neck, & esophageal cancers) has been less well established, but studies do support the possibility (Herrero, et al., 2003; Syrjanen, 2002).

HPV infections typically occur during the first few years of sexual activity, among adolescents or those in their early twenties (Berkow, Beers, & Fletcher, 1997; IARC, 1995). Research has revealed that the median duration of the new infection is normally eight months; about 70% of new infections clear up within one year and 91% clear within two years (Franco, et al., 1999; Ho, Bierman, Beardsley, Chang, & Burk, 1998; Molano, et al., 2003; Moscicki, et al., 1998). HPV-16 tends to persist longer than other types, though most are undetectable within two years (Ho, Bierman, Beardsley, Chang, & Burk, 1998).

Many factors have been found to be associated with persistence of HPV infection, including older age, high-risk HPV types, infection with multiple HPV types, and immune suppression (Hildesheim, et al., 1994; Ho, et al., 1995). Rates of HPV infection spontaneously resolving on its own or progression to cervical cancer without treatment vary for low-grade and high-grade cervical cell abnormalities. Low-grade cervical cell abnormalities typically resolve spontaneously (60%) and rarely progress to cancer (1%). Without treatment, high-grade cervical cell abnormalities spontaneously resolve much less often (30-40%) and progress to cancer without treatment much more often (12%) (Ostor, 1993). Co-factors that appear to be necessary for the development of cancer in addition to a persistent infection are long-term use of oral contraceptives, high number of live births, and co-infection with other STDs like Chlamydia,

herpes simplex virus-2 or genital herpes (Castle & Giuliano, 2003; Castellsague, Bosch, & Munoz, 2002; Castellsague & Munoz, 2003; Hildesheim, et al., 2001; Munoz, 2000; Munoz & Bosch, 1989; Sedjo, et al., 2003; Smith, et al., 2002; Smith, et al., 2003).

Progression to cervical cancer may not occur for 20 or more years after the first infection with HPV occurs, while genital warts normally appear one to six months later (IARC, 1995; Koutsky, 1997). Since cervical cancer typically occurs later in life (ages 35 and above) (Berkow Beers, & Fletcher, 1997; IARC, 1995), adolescents may be less concerned about HPV infection, and therefore protection from it than they are about acquiring genital warts or another STD.

While introduction of the Pap test has lowered the incidence of cervical cancer by about 75%, Pap tests detect only about 90% of cervical cancers (ACS, 2003; Koutsky, 1997). In the United States, an estimated 40% of women do not have regular Pap testing and in developing countries Pap testing just is not viable. Current cervical cancer treatment is not completely satisfactory and genital warts never entirely go away. Due to the fact that HPV infections can stay subclinical for many years, the spread of HPV cannot be halted merely by treatment of the disease, or by abstaining from sex during active periods of the disease. Condoms have been found to have limited effectiveness in preventing the transmission of HPV as it can be spread merely by skin contact (Koutsky, 1997). Prevention has been extremely challenging since HPV is highly contagious and because men typically are not screened for HPV (IARC, 1995; Koutsky, 1997; Ralefsky & Barraasso, 1996).

Costs associated with HPV may be significantly reduced with the implementation of a vaccine. A study of women in a U.S. health care plan estimated that on average, \$26,415 was spent per 100 women in cervical screening and treatment for HPV-related diseases. Extrapolating this data to the general U.S. population, it is estimated that annual healthcare costs

related to HPV were estimated to be \$3.4 billion in 1998. About 90% of the estimated costs was attributed to cervical cancer prevention (i.e., treatment for precancerous lesions and routine Pap tests), while the other 10% was used on the treatment of cervical cancer. An annual cost of \$51,863 was spent per 100 women ages 20 to 29 on HPV related healthcare (Insinga, Glass, & Rush, 2004). An estimated \$2.9 billion is spent on total lifetime medical costs of HPV infection for men and women ages 15 to 24, making it the second most expensive STD after HIV. Concerning genital warts alone, based on an incidence of 500,000 cases in 2000, the annual direct medical cost of all age groups was \$167.4 million (Chesson, Blandford, Gift, Tao, & Irwin, 2000). The transmission of HPV from mother to child during birth may cause the growth of warts in the upper respiratory tract of an affected child, which can cause significant upper airway problems that may require multiple surgeries, leading to additional healthcare costs (Bergler & Gotte, 2000; Silverberg, Thorsen, Lindeberg, Grant, & Shah, 2003). While psychological costs due to HPV may be difficult to measure in terms of a dollar amount, it is evident that distress, anxiety, concern, and embarrassment do exist (Basen-Esgquist, et al., 2003; Bell, et al., 1995; Champion, et al., 1988; Chandler, 1996; Lerman, et al., 1991; Maissi, et al., 2005; Persson, Dahlof, & Krantz, 1993). One report found that a diagnosis of genital warts is often the most anxiety-provoking of HPV infections (Baer, Allen, & Braun, 2000).

1.2 HPV KNOWLEDGE

Insufficient consideration has been given to promoting primary prevention of HPV. Previous research has found that knowledge of HPV in the United States is minimal among adolescents, undergraduate students, and even women who have had an abnormal Pap smear and were

referred for further testing (Biro, Rosenthal, Kollar, & Hillard, 1997; Dell, Chen, Ahmad, & Stewart, 2000; Holcomb, Bailey, Crawford, & Ruffin, 2004; Horn, McQuillian, Ray, & Hook, 1990; Jennings, 1997; Jubelirer, et al., 1996; Masad, Meyer, & Hobbs, 1997; Mays, et al., 2000; Pitts & Clarke, 2002; Ramirez, Ramos, Clayton, Kanowitz, & Moscicki, 1997; Sharp, Dignan, Dammers, Michielutte, & Jackson, 1990; Waller, et al., 2003). Other recent studies have found that adolescent and adult women who have heard of HPV report high rates of misunderstanding about the disease, its related conditions, the link of cervical cancer with an abnormal Pap test, and the function of cervical cancer screening (Dell, Chen, Ahmad, & Stewart, 2000; Goldie, et al., 2004; Harper, 2004; Holcomb, Bailey, Crawford, & Ruffin, 2004; Kulasingam & Myers, 2003; Mays, et al., 2000; Pitts & Clarke, 2002; Taira, Neukermans, & Sanders, 2004; Waller, et al., 2003; Zimet, Mays, & Fortenberry, 2000).

Dell and colleagues (2000) reported that only 13% of adolescents had heard of HPV in their study conducted in Canada. Holcomb, Bailey, Crawford, and Ruffin (2004) reported that of patients attending university and family practice clinics in the United States, 67% had heard of HPV. Baer, Allen, and Braun (2000) found that among first-year college students awareness and concern about STDs in general had increased among both males and females, but this increase in knowledge has not extended to HPV. Roughly 96% of both male and female students had heard of genital warts, but only 4.2% of males and 11.6% of females knew that HPV caused genital warts. The majority of students knew little about HPV infection, its transmission, and the prevalence of HPV relative to other common STD's.

A survey by Hoover, Carfioli, and Moench (2000) revealed that 34.5% of female respondents ages 18 and older had heard of HPV, while only 8.3% of those ages 17 and under had heard of the infection. Most of the respondents who heard of HPV did so at school (14.8%),

while only 9% heard of the infection from their doctor, and the same number informed by television (Hoover, Carfioli, & Moench, 2000). Studies in the United Kingdom found that only about 30% of women had heard of HPV, and experience with an abnormal Pap smear result was predictive of greater knowledge of HPV (Pitts & Clarke, 2002; Waller, et al., 2003). This is worth noting since it suggests that women were only educated about HPV once they have already experienced the infection.

Though research has shown that men are unaware of the link between HPV and cervical cancer (Baer, Allen, & Braun, 2000; Dell, Chen, Ahmad, & Stewart, 2000; Lambert, 2001; Yacobi, Tennan, Ferrante, Pal, & Roetzheim, 1999), other studies have found that men are willing to make positive behavioral changes should they understand the consequences of the disease (McPartland, Weaver, Lee, & Koutsky, 2005). The higher the understanding of HPV and its consequences, the higher the intention to decrease the number of sex partners. Over half of the men (53.7%) reported they would reduce the number of new sex partners if they were diagnosed with HPV and almost all (95%) indicated that they would use condoms with new partners. General knowledge of HPV infection was also associated with intention to encourage female sex partners to undergo Pap smear screening. These findings reveal that including men in HPV education and prevention can be very valuable.

The findings of Baer and colleagues (2000) suggest that both young men and women would like more information about STDs but either the information is not getting to them or the information they do receive is not presented clearly or is not easily accessible. It is important to note that these authors found that the main source of STD information for both male and female respondents was health education classes in middle or high school. The abundance of findings that knowledge about HPV is so limited suggests that negligible efforts have been made to

inform individuals, particularly men, about HPV. This reinforces the notion that additional information concerning HPV needs to be disseminated and the involvement of adolescents and young adults in the creation of sex education interventions and prevention strategies would be beneficial. Programs developed by health professionals without input from the population most at risk of infection may not be doing the job. Redesigning curricula to involve the information adolescent and young adults want and need to know, as well as how they feel it is best delivered, may be more effective.

1.3 HPV VACCINE ACCEPTANCE

Previous research concerning other STD vaccines in development, such as HIV and genital herpes, suggests that vaccine acceptability should not be taken for granted (Barie, Dellinger, Dougherty, & Fink, 1994; Fedson, 1994; Liao, Zimet, & Fortenberry, 1988; Rosenthal, Kottenhahn, Biro, & Succop, 1995; Wood, Pereyra, Halfon, Hamlin, & Grabowsky, 1995; Zimet, et al., 1997; Zimet, Liao, & Fortenberry, 1997). Even for non-STDs, vaccine acceptance has been low (Fedson, 1987). Thus, given the shame and stigma incurred by STDs, additional opposition to STD vaccinations is likely (Zimet, et al., 1997).

Numerous studies of already existing vaccines shown to be safe and effective (e.g., influenza, hepatitis B) report inadequate vaccination acceptance among those most at risk for the very conditions vaccines would protect against (Barie, Dellinger, Dougherty, & Frank, 1994; Bates, Fitzgerald, Dittus, & Wolinsky, 1994; CDC, 1998; Fedson, 1994; Zimet, Kee, Winston, Perkins, & Maharry, 2001). Failure to get recommended immunizations is seen in even high-risk professional groups like doctors and nurses (Barie, Dellinger, Dougherty, & Fink, 1994).

Reasons reported for not getting immunized for hepatitis B are low perceived susceptibility, concern over vaccine efficacy and safety, general inertia, and fears about getting injections (Barie, Dellinger, Dougherty, & Fink, 1994; Bodenheimer, Fulton, & Kramer, 1986; Crossley, Gerding, & Petzel, 1985; Israsena, Kamolratanakul, & Sakulramrung, 1992; Lettau, Blackhurst, & Steed, 1992; Manian, 1991; McKenzie, 1992; Mundt, 1992; Scapa, Karpuch, Waron, & Eshchar, 1989). Zimet, Liao, & Fortenberry (1997) found that only 30% of respondents opposed getting an HIV vaccine. Susceptibility, perceived benefits, pragmatic obstacles, conditional nonmembership in a risk group, and fear of the vaccine demonstrated significant independent predictive power of intention to get vaccinated against HIV.

Many of the previously stated reasons for not getting vaccinated are related to aspects of the Health Belief Model (HBM), which postulates that individuals will engage in preventive behaviors if they believe themselves to be at risk of contracting a particular condition and if the benefits of preventive actions outweigh the barriers to, or costs of, such actions (Glanz, Rimer, & Lewis, 2002). The HBM has been used successfully to predict vaccine acceptance for various conditions, including influenza, poliomyelitis, and hepatitis B (Bodenheimer, Fulton, & Kramer, 1986; Frank, Henderson, & McMurray, 1985; Oliver, & Berger, 1979; Rosenstock, Derryberry, & Carriger, 1959).

Recent research suggests there are various factors likely to affect successful implementation of future immunization programs designed to prevent STDs (Zimet, Mays, & Fortenberry, 2000). One factor found to affect vaccine acceptance in the past, at least in the United States, is social or moral grounds. That is, individuals have claimed that STDs are suitable punishment for premarital sexual behavior and effective STD prevention may reduce the deterrent to engage in premarital sexual activity, thus feeling it will lower their social and moral

values (Brandt, 1985). However, due to recent HIV education in the U.S., there is some indication that this STD stigma has lessened (Herek, Capitano, & Wideaman, 2002).

Other factors related to STD vaccine acceptance are associated with various health beliefs, particularly perceived susceptibility to infection, perceived benefits of getting the vaccine, barriers to vaccination, and social norms (Liau & Zimet, 2000; Rosenthal, Kottenhahn, Biro, & Succop, 1995; Rosenthal, Lewis, Succop, Bernstein, & Stanberry, 1999; Zimet, et al., 1997; Zimet, Liau, & Fortenberry, 1997). Choosing to get immunized for an STD implies acknowledgement that one is at risk for acquiring an STD. Adolescents and college-aged males and females, on average, do not consider themselves vulnerable to STDs (Baer, Allen, & Braun, 2000; Dell, Chen, Ahmad, & Stewart, 2000; Ramirez, Ramos, Clayton, Kanowitz, & Moscicki, 1997; Yacobi, Tennan, Ferrante, Pal, & Roetzheim, 1999), and thus are not apprehensive about HPV (Baer, Allen, & Braun, 2000; Dell, Chen, Ahmad, & Stewart, 2000).

Previous research has shown that acceptance of an HPV vaccine is associated with vaccine efficacy, cost, physician recommendation, positive beliefs about vaccines, and knowledge (Davis, Dickman, Ferris, & Dias, 2004; Kahn, Rosenthal, Hamann, & Bernstein, 2003; Rosenthal, Kottenhahn, Biro, & Succop, 1995; Zimet, Mays, Winston, et al., 2000). Another study found that the best predictor of adolescent acceptance of the hepatitis B vaccine was their perception that their parents felt the vaccination was important (Rosenthal, Kottenhahn, Biro, & Succop, 1995).

Vaccine acceptance among physicians and various health care providers is also essential to the success of vaccine implementation. Research suggests that HPV vaccine acceptance is high among physicians, though various factors affect recommendation. Riedesel, et al. (2005) found that family physicians were significantly more likely to recommend the vaccine to girls

and older adolescents than they were to boys and younger adolescents. Physicians were more likely to recommend the vaccine to boys and girls if it prevented against cervical cancer and genital warts versus cervical cancer alone. Gender of the provider (female), higher knowledge about HPV, and positive attitudes about vaccination were independently and positively associated with physicians' intention to recommend an HPV vaccine. Though most of the study respondents did report a high level of comfort addressing issues of sexuality, a finding that differs from other studies (Haley, Maheux, Rivard, & Gervais, 1999; Maheux, Haley, Rivard, & Gervais, 1995), the authors speculate that a provider's unwillingness to vaccinate young adolescents may be because of feeling uneasy discussing matters of sexuality with young teens or their parents or a belief that young adolescents are not at immediate risk for HPV. They did find that those who reported discomfort addressing sexuality issues had lower intention to recommend the vaccine.

Another study by Raley, Followwill, Zimet, and Ault (2004) found that the most important factor in vaccine administration among gynecologists was American College of Obstetricians and Gynecologists (ACOG) recommendations, followed by vaccine efficacy, age, and disease targeted. Concerning the disease targeted, gynecologists were more likely to recommend a vaccine that prevented against cervical cancer, or cervical cancer and genital warts than one that prevented against genital warts alone. Unlike the findings by Riedesel et al. (2005), Raley and colleagues found that demographic characteristics of the gynecologists, including age, gender, practice setting, and community setting, did not play a pivotal role in their decisions regarding the vaccine.

The previously mentioned findings concerning gynecologists and obstetricians are noteworthy, though the low response rate has been a major dilemma. In their study by Riedesel

and colleagues (2005), which randomly distributed surveys to 1,000 American Academy of Family Physicians (AAFP) members, only 155 surveys were returned (15.5%) and only 145 were used in the analysis. Raley et al. distributed their surveys to 1200 Fellows of ACOG though only 181 (15.1%) surveys were returned and included in their analysis. Such low response rate leads to caution in generalizing their results.

1.4 GENDER DIFFERENCES

Very few studies have actually assessed men's acceptance of an HPV vaccine. McPartland, Weaver, Lee, and Koutsky (2005) examined young men's perceptions of HPV. Though they did not assess intention to receive an HPV vaccine, results showed that understanding that HPV may have severe consequences for women was associated with men's intention to reduce their number of sex partners. Vaccinating both genders would help to prevent the transmission of the virus between men and women as well as prevent putting responsibility for prevention solely on the women.

Due to differences in the views on STDs and healthcare by gender, differences in vaccine acceptance may also differ by gender. Women were found to be more knowledgeable about genital herpes and susceptibility to STDs, while they also reported more negative reactions to becoming infected and greater concern over parents' reactions to the infection as compared to men (Lewis, Bernstein, Rosenthal, & Stanberry, 1999). Men and women also differ when it comes to seeking healthcare for numerous illnesses, such as diabetes, tuberculosis, and psychiatric disorders. Men tend to go for care only when their symptoms are more severe, thus, often after they have fully developed (Albizu-Garcia, Alegria, Freeman, & Vera, 2001; Hjelm,

Nyberg, & Apelqvist, 2002; Johansson, Long, Diwan, & Winkvist, 2000). Women are more preventative, seeking routine care to stop the problem before it occurs, or seeking care before the problem progresses. Women also tend to worry more about their health and that of their partners (Aten, Siegal, & Roghmann, 1996; Norcross, Ramirez, & Palinkas, 1996). These differences may extend to vaccine acceptability, affecting the decision making process of men and women. A study by Hoover, Carfioli, and Moench (2000) found that almost 95% of the women they surveyed felt men should be vaccinated against HPV to prevent transmitting the infection to their partners, and 100% felt that men should receive a vaccine against HPV if the vaccine would also protect men against genital warts.

Others have investigated whether there is a difference between men and women in STD vaccine acceptability but have found no differences (Liau & Zimet, 2000; Rosenthal, Lewis, Succop, Bernstein, & Stanberry, 1999; Zimet, et al., 1997; Zimet, Kee, Winston, Perkins, & Maharry, 2001). However, these studies looked at the rates of acceptance, not the reasons why or why not by gender. Auslander et al. (2005) explored whether there were gender differences in the role of health beliefs (perceived severity, perceived susceptibility, barriers, and social influence) on acceptance of a genital herpes vaccine. A history of an STD and high perceived risk of becoming infected with genital herpes were significant predictors of vaccine acceptance for men, while younger age and vaccine safety concerns were significant predictors for women. These findings imply that health-care messages concerning STD vaccines need to take gender into consideration.

Thus, the overall aim of this research project is to assess the intent to receive an HPV vaccine among students attending an urban university by exploring age and gender of those willing and not willing to receive the vaccine as well as differences in preferences for potential

vaccine attributes. It is hypothesized that 1) women will be more willing than men to receive an HPV vaccine, 2) younger students will be more willing to accept an HPV vaccine that prevents genital warts as compared to one that prevents cervical cancer alone, and 3) men will be more willing to receive an HPV vaccine that prevents genital warts.

2.0 METHODS

2.1 STUDY DESIGN

In this cross-sectional study participants were recruited by convenience sampling at the University of Pittsburgh in Pittsburgh, Pennsylvania. The majority of recruitment was conducted at the university's Student Health Services while some surveys were distributed in two undergraduate psychology courses, Health Psychology and Research Methods. The study was completed several months prior to actual availability of the vaccine. The study was approved by the University of Pittsburgh's Institutional Review Board and was completely anonymous, thus written informed consent was not obtained.

The researcher approached students individually while they were sitting in the Student Health Services waiting room explaining who she was, where she came from, and what the study was about. She went on to tell participants the survey was completely voluntary and anonymous, and should they decide to complete the questionnaire, their honesty was very important and greatly appreciated. Lastly, she asked each of them to be sure to read the instructions carefully and then when done, to place the survey in the envelope provided so that their answers would remain confidential and anonymous. The same information was provided collectively to students who completed the survey during class time, in addition to an emphasis on the fact that their participation would have no bearing on their standing in class. Students did not put their

name on the survey, thus they were completely anonymous. Participants received a \$1 lottery ticket as a token of appreciation for completing the survey.

2.2 SAMPLE

Three hundred and fifty-five university students were asked to complete the five to 10 minute self-administered questionnaire containing 34 questions. Over a one month time period (April of 2006) 340 surveys were completed at the three sites; nine refused and six were returned incomplete.

2.3 MEASURES

Validated measures of attitudes regarding acceptance of an HPV vaccine do not exist; thus, theory and related articles were utilized to develop items specific to this topic (Rosenthal, Lewis, Succop, Bernstein, & Stanbery, 1999). Initial items were reviewed by experts in the field and several college students and then modified to enhance brevity, clarity, and understanding.

Vaccine intent was assessed by describing specific vaccine attributes and was measured by having the participants answer the following questions: “Assuming the HPV vaccine was available now, how likely would you be to get the vaccine if 1) it prevented all HPV, 2) it prevented cervical cancer in women, but did not prevent genital warts, 3) it prevented genital warts, but did not prevent cervical cancer, and 4) it prevented both genital warts and cervical

cancer.” The response options given were a 5-point Likert scale ranging from “Extremely likely” to “Extremely unlikely”.

The survey also assessed demographics, sexual history, perceived and actual knowledge of HPV, and lastly attitudes and perceived health beliefs. Perceived knowledge was assessed after giving the participants a brief statement describing HPV. The statement read “HPV is a sexually transmitted virus that can cause genital warts or cancer”. Participants were then asked, “How knowledgeable would you describe yourself when it comes to Human Papillomavirus or HPV?” Actual knowledge was measured by asking the participants to agree or disagree with three statements; “HVP can be asymptomatic” (True), “HPV can spontaneously resolve completely without treatment” (True), and “Greater than 50% of sexually active college students will have HPV once during college” (True). A sum score of 0 to 3 was then computed and those with a score of 2 or 3 were classified as knowledgeable.

Perceived susceptibility was assessed by asking what the participants thought their chances of getting HPV sometime in their lives were as well as their chances of getting a complication from HPV should they become infected. The response options for each were “0-20%”, “21-40%”, “41-60%”, “61-80%”, and “81 to 100%”. Perceived severity was assessed by asking participants to agree or disagree with the following statement; “HPV is not serious enough for a vaccine” and “How upset would you be if you were told that you: a) have genital HPV but you have no symptoms and b) have genital warts?” Participants chose from answers on a 5-point scale of “worst thing that could happen” to “not at all upset”. Participants were also asked, “How severe do you think genital HPV infection is for yourself?” We also assessed whether perceived norms, specific recommendations, or costs would lead persons to be more or less likely to accept the vaccine, using a 7-point scale ranging from “much more likely to accept”

to “much less likely to accept”. Specifically, persons were asked whether the following would make him or her more or less likely to get the vaccine, “friends and family would know that I got the HPV vaccine” and “the HPV vaccine was recommended to me by my a) doctor, b) spouse/partner, c) friends, and d) parents”. Attitudes about cost were also assessed by asking whether “Having to pay \$50 for the HPV vaccine myself” and “Having the HPV vaccine be free” made the participants more or less likely to get the vaccine.

2.4 DATA ANALYSIS

Data analysis was conducted using the Statistical Package for the Social Sciences, 14.0 for Windows (SPSS Inc., Chicago, IL). The main outcome measure, intent to receive an HPV vaccine, was dichotomized into “Extremely or somewhat likely” and “Not likely, Somewhat unlikely, or Unsure”. Comparisons were then made by gender via chi-squared tests with the statistical significance level set at $p \leq .05$. Analyses of intent to receive an HPV vaccine were also conducted by the specific vaccine attributes: preventing “all HPV” and “both genital warts and cervical cancer”. Responses were similar in both men and women, thus during the final analyses we chose to look only at the responses to the question when worded as “both genital warts and cervical cancer”. Multivariate logistic regression analyses were also performed to assess the relationship of demographics, sexual and STD history, knowledge, and attitudes to vaccine acceptance.

3.0 RESULTS

3.1 DESCRIPTIVE ANALYSIS

The study sample consisted of 340 university students, 138 males and 202 females, ages 18 to 32 (mean age =20.8). Participants were mostly white, 82.6%, and a majority of the surveys were completed at the Student Health Center (65%). More than half of the participants, 67.1%, were currently dating (one steady partner or no specific partner) and 32.9% were not dating, married, or living with someone. One-fourth of the participants, 24.8%, reported never having sexual intercourse and of the rest (75.2%), 18.2% had one partner, 37.8% had two to five partners and 22.6% had more than five partners. Few (9.4%) reported ever having a sexually transmitted disease, while 6.8% reported having HPV and 1.2% reported having genital warts. About three-fourths, 66.5%, of the participants got zero or one of the three knowledge questions correct, and 82.4% perceived themselves as either somewhat knowledgeable of HPV or not at all knowledgeable. See Table 1 for a further breakdown by gender.

Table 1 Characteristics of Study Population by Gender

Variable	Male n = 138 n (%)	Female n = 202 n (%)
Age		
18 to 19	35 (25.4)	61(30.5)
20	32 (23.2)	59(29.5)
21	23 (16.7)	42 (21.0)
22 to 32	48 (34.8)	38 (19.0)
Race		
Asian	6 (4.3)	8 (4.0)
Black/African American	9 (6.5)	26 (12.9)
White	118 (85.5)	163(80.7)
Unknown	5 (3.6)	5 (2.5)
Recruitment Setting		
Student Health Center	107 (77.5)	114 (56.4)
Psychology Class	31 (22.5)	88 (43.5)
Relationship Status		
Not dating	38 (27.5)	43 (21.3)
Dating no specific partner, single, never married	38 (27.5)	38 (18.8)
Dating 1 steady partner (not living together)	50 (36.2)	102 (50.5)
Married, dating 1 steady partner (living together)	12 (8.7)	19 (9.4)
No. Partners		
0	31 (23.0)	41 (20.4)
1	22 (16.3)	39 (19.4)
2 to 5	46 (34.1)	81 (40.3)
More than 5	36 (26.7)	40 (19.9)
Knowledge		
2 or 3 questions correct	30 (21.7)	84 (41.6)
0 or 1 questions correct	108 (78.3)	118 (58.4)
Perceived Knowledge		
Extremely or Very	18 (13)	39 (19.6)
Somewhat	41 (29.7)	89 (44.7)
Not at all	79 (57.2)	71 (35.7)
Ever had an STD (yes, 9.4%)	9 (6.5)	23 (11.4)
Ever had HPV (yes, 6.8%)	9 (39.1)	14 (60.9)
Ever had GW (yes, 1.2%)	2 (50.0)	2 (50.0)
<i>Note.</i> STD = Sexually Transmitted Diseases; HPV = Human papillomavirus; GW = Genital warts		

3.2 FACTORS ASSOCIATED WITH VACCINE ACCEPTANCE

Several factors were significantly associated with intention to receive the vaccine in the overall sample (see Table 2). These factors include ever having an STD, having someone close to him/her have HPV, having been sexually experienced, and having more partners. Of those who have ever had an STD, 96.9% would accept the vaccine compared to 82.8% of those who never had an STD ($p < .05$). Of those who had someone close to him/her have HPV, 94% would accept the vaccine compared to 85.3% of those who either did not know anyone close to them who had HPV and 76.7% of those who responded they did not know if someone close had HPV ($p < .01$). Seventy-one percent of those who had no sexual partners would accept the vaccine, 82.0% of those with one lifetime partner, 87.4% of those with 2 to 5 lifetime partners, and 93.4% of those with more than 5 partners would accept the vaccine ($p = .001$).

The more HPV knowledge a person perceived him or herself as having, the more knowledge questions one answered correctly, both of which were significantly associated with accepting the vaccine. Ninety-five percent of those who perceived themselves as “extremely” or “very” knowledgeable about HPV would accept the vaccine, 89.9% of those who perceived themselves as “somewhat”, and 77.3% of those “not at all” knowledgeable of HPV would accept the vaccine ($p < .01$). Seventy-nine percent of those getting zero of the knowledge questions correct accepted the vaccine, 78.2% of those who got one correct, 94.4% of those answering 2 correctly, and 100% of those answering all three questions correctly would accept the vaccine ($p = .001$).

Greater perceived risk was also associated with an increased likelihood of intention to receive the vaccine. Seventy-five percent of those answering “0 to 20%” for perceived risk of acquiring HPV at some point in their life would accept the vaccine, while 88.8% of those answering “21 to 60%” and 98.2% of those answering “61 to 100%” would accept the vaccine ($p < .001$). Seventy-eight percent of those not dating, married, or living with someone would accept the vaccine, and 87.3% of those dating one steady partner, or no specific partner would accept the vaccine ($p < .05$). Vaccine acceptance was not found to be significantly associated with age, race, recruitment setting, ever having HPV or genital warts, or perceived severity of HPV.

Other factors found to make the participant “much more likely to accept the vaccine” were having a free vaccine (65.0%) and a doctor’s recommendation (42.4%). Having to pay \$50 for the vaccine made 63.3% of participants “much less likely to accept the vaccine”. People whose spouse (29.7%), parent (24.1%), or friend (18.5%) recommended the vaccine were “much more likely to accept the vaccine”.

Table 2 Accept Vaccine that Prevents Against both Cervical Cancer and Genital Warts

		Extremely or Somewhat Likely	
		n (%)	P value
Gender			0.006
	Male (n =138)	107 (77.5)	
	Female (n =202)	179 (88.6)	
Age			0.814
	18 to 19 (n =96)	83 (86.5)	
	20 (n =91)	75 (82.4)	
	21 (n =65)	56 (86.2)	
	22 to 32 (n = 86)	71 (82.6)	
Race			0.176
	Asian (n =14)	12 (85.7)	
	AA (n =35)	25 (71.4)	
	White (n =281)	241 (85.8)	
	Unknown (n =10)	8 (80.0)	
Recruitment Setting			0.058
	Student Health Center	192 (86.9)	
	Psychology Class	94 (79.0)	
Knowledge T/F			0.001
	0 correct (n =93)	73 (78.5)	
	1 correct (n = 133)	104 (78.2)	
	2 correct (n =89)	84 (94.4)	
	3 correct (n =25)	25 (100)	
Perceived knowledge			0.005
	Extremely / Very (n =57)	54 (94.7)	
	Somewhat (n =130)	113 (86.9)	
	Not at all (n =150)	116 (77.3)	
Current Relationship Status			0.023
	Not dating, married, or living with someone (n = 112)	87 (77.7)	
	Dating 1 partner or no specific partner (n = 228)	199 (87.3)	
# of Sex partners			0.001
	0 (N =72)	51 (70.8)	
	1 (n =61)	50 (82.0)	
	2 to 5 (n =127)	111 (87.4)	
	More than 5 (n =76)	71 (93.4)	
Ever STD			0.038
	Yes (n =32)	31 (96.9)	
	No (n =308)	255 (82.8)	
Ever HPV			0.116
	Yes (n =23)	22 (95.7)	
	No (n =316)	263 (83.2)	
Ever GW			0.380
	Yes (n =4)	4(100.0)	
	No (n = 334)	280 (83.8)	
Anyone close HPV			0.007
	Yes (n =67)	63 (94.0)	
	No (n =156)	133 (85.3)	
	Don't Know (n=116)	89 (76.7)	

Table 2 (continued)

Perceived Risk			0.000
	0 to 20% (n =158)	119 (75.3)	
	21 to 60% (n =125)	111 (88.8)	
	61 to 100% (n =56)	55 (98.2)	
Perceived severity of HPV			0.730
	Worst thing that could happen	14 (77.8)	
	Extremely upset	120 (84.5)	
	Very upset	95 (82.6)	
	Somewhat upset	56 (87.5)	
	Not at all upset	0	
<i>Note.</i> STD = Sexually Transmitted Diseases; HPV = Human papillomavirus; GW = Genital warts			

3.3 GENDER COMPARISONS

When examined by gender differences emerged (see Figure 1). Males were more likely to accept the vaccine if it prevented both genital warts and cervical cancer, rather than one for cervical cancer alone (77.5% vs. 34.1%; $p < .001$). Females were significantly more likely than men to accept an HPV vaccine that prevented both genital warts and cervical cancer (88.6% vs. 77.5%; $p < .01$).

Men who were married, living with someone, or not dating were significantly less likely to accept the vaccine than those dating one partner or no specific partner (64.0% vs. 85.2%; $p < .01$). Men who have had no sexual partners were significantly less likely to accept the vaccine compared to those with five or more partners (51.6% vs. 88.9%, $p < .001$). Lastly, men who have ever had an STD were significantly more likely to accept the vaccine than those who never had an STD (100% vs. 80.4%; $p < .05$).

Concerning women, answering two or three of the three knowledge questions correctly was significantly associated with accepting the vaccine compared to getting none or one correct (97.6% vs. 82.2%; $p < .001$). Both men and women with higher perceived risk of getting HPV were more likely to receive the vaccine; those who answered they were “61 to 100%” likely to get HPV some point in their life were significantly more likely to get an HPV vaccine than those who felt they were only “0 to 20%” likely to get HPV (men, 93.3% vs. 68.7%, $p < .05$; women, 100% vs. 80.2%, $p < .01$). Intention to receive the vaccine was not significantly associated with age or race after stratifying by gender.

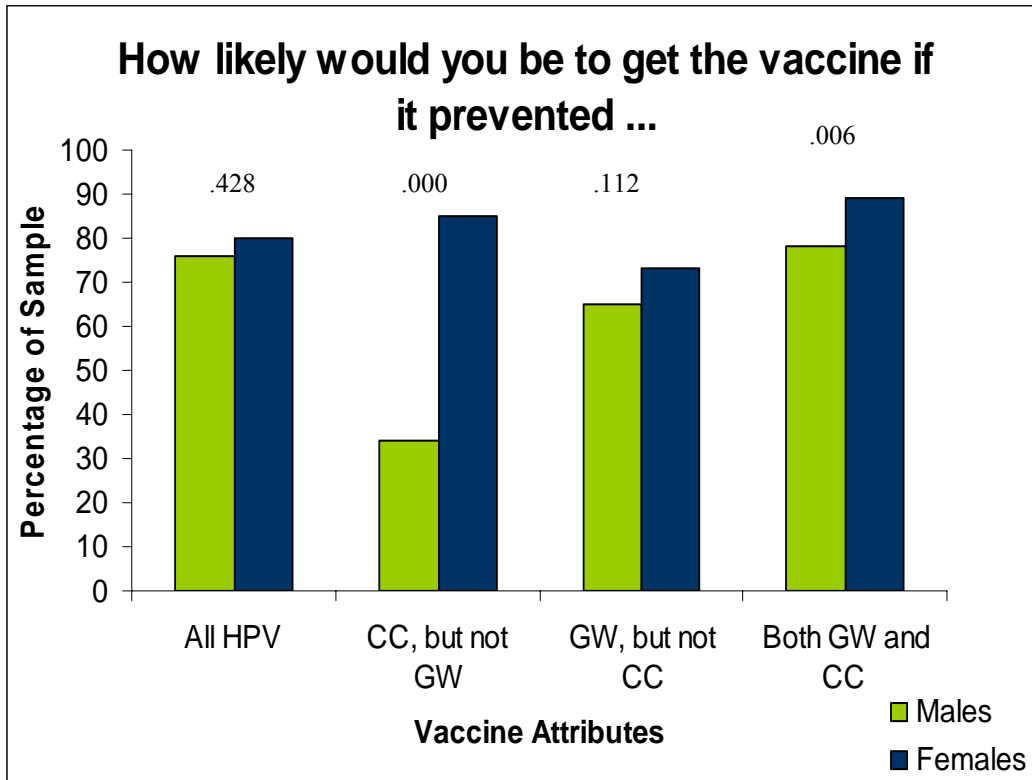


Figure 1 Proportion of university men and women who reported they would be “somewhat likely” or “extremely likely” to accept an HPV vaccine if it prevented various conditions.

In the multivariate regression, both men and women were significantly more likely to accept an HPV vaccine if they had more than five sexual partners and higher HPV knowledge (see Table 3). Participants having more than five partners were about four times more likely than those having no partners to accept the vaccine (OR = 4.43; 95% CI = 1.36, 14.39). Participants answering two or three of the three knowledge questions correctly were about three times more likely to get the vaccine as compared to those answering no or only one knowledge question correctly (OR = 3.59; 95% CI = 1.3, 9.93). After stratifying by gender, women who answered two or three knowledge questions correctly were significantly more likely to accept the vaccine (OR = 8.17; 95% CI = 1.57, 42.61) and women who were ages 18 to 19 were significantly more

likely than those 22 to 32 years old (OR = 5.36; 95% CI = 1.02, 28.04). Though not significant, those who were ages 20 and 21 were more likely than those 22 to 32 years old (OR = 5.08; CI = .95, 27.12; OR = 1.78; CI = .39, 8.18, respectively). Non-white women were almost half as likely as whites (OR = 0.2; 95% CI = 0.06, 0.63) to accept the vaccine. Men who had one or two partners were about five times more likely (OR = 5.13; 95% CI = 1.27, 20.67), those with three to five partners were about 14 times more likely (OR = 14.14; 95% CI = 3.48, 57.37), and those with more than five partners (OR = 9.34; 95% CI = 2.22, 44.53) were nine times more likely than those with no partners to accept the vaccine.

Table 3 Binary Logistic Regression of HPV Vaccination Acceptability

	Overall	Male	Female
Gender (female)	1.94 (.99, 3.77)	-----	-----
Age			
18 to19	2.36 (.89, 6.28)	1.56 (.39, 6.24)	5.36 (1.02, 28.04)
20	1.31 (.53, 3.24)	.4 (.11, 1.41)	5.08 (.95, 27.12)
21	1.63 (.59, 4.52)	4.9 (.73, 32.86)	1.78 (.39, 8.18)
22 to 32	-----	-----	-----
Race (non-white/unknown)	.62 (.28, 1.37)	2.45 (.55, 10.98)	.2 (.06, .63)
# partners			
0	-----	-----	-----
1 to 2	1.65 (.66, 4.08)	5.13 (1.27, 20.67)	.57 (.12, 2.83)
3 to 5	2.30 (.99, 5.35)	14.14 (3.48, 57.37)	.51 (.13, 2.02)
More than 5	4.43 (1.36, 14.39)	9.34 (2.22, 44.53)	3.16 (.27, 36.92)
Knowledge (2 or 3 correct)	3.59 (1.30, 9.93)	1.87 (.42, 8.27)	8.17 (1.57, 42.61)
Risk of HPV			
0 to 20%	-----	-----	-----
21 to 60%	2.02 (.96, 4.25)	1.84 (.62, 5.47)	5.47 (1.39, 21.49)
61 to 100%	7.51 (.94, 60.1)	7.88 (.67, 92.52)	*
* Not put in model because 100% of women who answered 61 to 100% chose to take the vaccine			

4.0 DISCUSSION

This study suggests that in order to enhance the success and uptake of an HPV vaccine, promotional strategies and educational campaigns need to be specific with regard to gender, and should be tailored according to characteristics such as sexual experience, relationship status, and knowledge.

This study's results suggest that intention to receive an HPV vaccine is high among this cohort of university men and women, though slightly higher in women, supporting the first hypothesis. Findings also suggest that potential vaccine attributes, particularly prevention against both genital warts and cervical cancer, notably influence intention to receive the vaccine among both young men and women, though not in relation to age as was stated in the second hypothesis. Men in particular are significantly more likely to intend to get the HPV vaccine when it is described as preventing both cervical cancer and genital warts versus one that prevents against cervical cancer alone, as was stated in the third hypothesis. This implies that the wording used in the promotion of the vaccine may play a significant role in how the vaccine is perceived, especially due to the previously mentioned finding that physicians are more likely to recommend the vaccine if it prevents cervical cancer and genital warts versus one that prevents cervical cancer alone (Riedesel et al., 2005). This information can aid in the decision-making process of the current policy debate on whether to emphasize the benefits of the vaccine in terms of both cancer and STD prevention, versus placing emphasis on the prevention of cancer only.

These findings also reveal that gender differences in intention to receive the vaccine do exist, and that overall, students who are dating, sexually experienced, have had more sexual partners, or have ever had an STD have higher intention to receive the vaccine. Higher knowledge in terms of HPV, and consequently an increase in perceived risk of acquiring an HPV infection, also leads to increased intention to receive the vaccine. Though age is not significantly related to intention to receive the vaccine in regards to specific vaccine attributes, the regression analysis reveals that younger women are more likely to be interested in getting the vaccine compared to older women. Each of these results may help determine how the vaccine should be promoted to maximize vaccine uptake.

The findings that sexually inexperienced individuals are less likely to accept an HPV vaccine has implications that need to be addressed since these are the very people who should be targeted to receive the vaccine given that they are least likely to already be infected with the disease. Recommendations by the FDA and ACIP have been made to encourage vaccination before the initiation of sexual activity because vaccinating individuals before they become sexually active is most effective in preventing the acquisition of HPV (Kaiser Family Foundation, 2006). This means it is imperative to educate adolescent and young adults about HPV even if they are not sexually active since they may be less likely to agree to receive the vaccine. The results show that education can increase the likelihood of accepting the vaccine as those who were more educated on HPV were more likely to accept the vaccine.

Previous research has shown that physician recommendation is one of the strongest factors that contribute to vaccine acceptability (Rosenthal, Kottenhahn, Biro, & Succop, 1995; Zimet, Mays, Winston, et al., 2000). It is also important to note here that individuals in this study were much more willing to receive the vaccine should their doctor recommend it, which

points out the pivotal role health care providers play in educating individuals about HPV and encouraging them to receive the vaccine. Vaccine recommendations among physicians has been found to be high, depending on factors such as patient's age, gender, sexual history, and vaccine efficacy (Raley, Followwill, Zimet, & Ault, 2004; Riedesel, et al., 2005). Therefore, healthcare providers must be informed about their pivotal role in the decision making process for many individuals as well as vaccine safety, efficacy and consequences of an HPV infection.

The data presented here suggest that insurance coverage for the vaccine would significantly increase actual vaccine acceptance. These findings are similar to that of Hoover, Carfioli, and Moench (2000), who found that only 15% of respondents would be extremely likely to pay for an HPV vaccine if the costs were not covered by insurance, and 31.7% would be either somewhat or extremely unlikely to pay for an HPV vaccine.

A vaccine protecting against the most common types of HPV will not only improve the health of millions of women, but also reduce the health care costs associated with this disease. One study found that if a vaccine that was 75% effective in preventing high-risk HPV infections were administered to two million 12-year-old girls, it would prevent 224,255 infections, 3,317 cases of cancer, and 1,340 cervical cancer-related deaths (Sanders & Taira, 2003). Another study predicted that a vaccine preventing HPV types 16 and 18 would decrease cervical cancer cases associated with these two types by 95% (Taira, Neukermans, & Sanders, 2004). Baer, Allen, and Braun (2000) predicted that vaccinating women only would be 68% as effective as vaccinating both genders. It is expected that the vaccine would not only be effective economically by reducing healthcare costs, but also by reducing the emotional burden of anxiety, fear, and embarrassment caused by a diagnosis with genital warts or an abnormal Pap test.

These benefits of vaccination are obvious for the developed world. However, women in developing countries may benefit even more. In many developing countries, cervical cancer is the leading cause of death and often screening programs are very difficult to implement and maintain. Vaccine administration is expected to be cost-effective, though issues still do exist such as acceptance and most importantly having the necessary infrastructure available for providing access to all three shots (Goldie, et al., 2004).

The findings presented here correspond with those of other researchers, though with some differences. One study found that the disease targeted by the vaccine (i.e., genital warts or cervical cancer) did not appear to play a key role in evaluation of the vaccine, though these findings were based on interviews with 40 adolescent and adult women (Zimet, Mays, Winston, et al., 2000). Another study of 60 women ages 15 to 28 found that they preferred a vaccine that protected against 70% of cancer and 100% of genital warts to one that protected against 85% of cancer only. Concern about cervical cancer did not entirely overshadow apprehensions about other HPV infections such as genital warts as over half of the respondents were equally concerned about both infections and 7% were more concerned about genital warts. Most respondents preferred a vaccine that protected against genital warts even if coverage against cervical cancer was reduced (Hoover, Carfioli, & Moench, 2000).

Other research found that sexual experience and an increased number of sexual partners increased hypothetical vaccine acceptance, while race and gender did not (Boehner, Howe, Bernstein, & Rosenthal, 2003; Kahn, Rosenthal, Hamann, & Bernstein, 2003). Boehner and colleagues (2003) concluded that presenting the vaccine as preventing sexually related problems, instead of reproductive problems, does not significantly affect or deter vaccine acceptance.

5.0 CONCLUSIONS

The development and approval of an HPV vaccine provides great potential for improving the health of millions of women, as well as men, but the key to success is in the administration of this vaccine. Focusing on women alone undermines the significance of HPV infection for men and downplays the fact that men are major players in transmission of the virus. Preventing the transmission of HPV requires both men and women to be cognizant of the infection and the complexity of prevention tactics. Public health initiatives that want to facilitate HPV vaccine administration may be more successful if programs are designed to educate both sexes about the infection, the vaccine, and HPV-related complications.

Limitations of this study include the fact that it is based on a hypothetical vaccine, though intention is often associated with actual behavior (Glanz, Rimer, & Lewis, 2002). In addition, cost was not assessed directly since this study was conducted before the vaccine was approved by the FDA and the cost of the vaccine was not known yet. Thus, the survey question assessing cost asked about paying \$50 for the vaccine, when in reality the vaccine will cost about \$360.

Other limitations include the difference in the number of men and women, a relatively small number of non-white participants, and the use of convenience sampling involving men and women from only one large university. Another limitation is the small number of students reporting having same sex partners, thus not allowing the examination of vaccine acceptability among gay men or lesbian women, which is an additional public health challenge that is not well

understood. Additionally, those individuals who were willing to fill out the survey while waiting in the Student Health Center may have been different from those who refused. Those who were willing may have had a higher interest in the topic, and felt more comfortable answering questions regarding sexual and reproductive health. Those who refused may have been less educated about HPV, or their own history may have made them less comfortable with the topic. The very fact that the students were recruited in a health center may make them different from others as they may take a more active role in their healthcare, possibly explaining why the study sample consisted of more women than men. Though the generalizability of these results may be limited, the findings have implications for future research as well for the design and implementation of a vaccine administration plan. More studies are needed at various colleges of different sizes and in different areas, as well as with individuals of the same age who are not students. Now that the vaccine is becoming available, researchers will also want to determine who is actually receiving the vaccine and the reasons why or why not.

An HPV vaccination programs must still overcome many barriers. One major barrier to a successful HPV vaccine administration program is the price of the vaccine. At \$360 for three doses, this vaccine is one of the most costly. The CDC's Advisory Committee on Immunization Practices expects the cost of the vaccine to be covered by most federal and private insurance companies, but this is no help to those who are uninsured or underinsured. However, the federal Vaccines for Children Program will provide the vaccine free for disadvantaged children under the age of 19 who are uninsured, on Medicaid, Alaska Natives or American Indians (CDC, 2006c). Other barriers include identifying appropriate candidates, determining if and when boosters will be needed in case immunity wanes over time, and how health professionals can overcome the potential individual, parental, and social barriers to vaccine acceptance.

One strategy to promoting the vaccination would be to perform universal vaccination so that no one feels stigmatized. Most health care professional associations develop their own policies on the recommendations made by the ACIP, though after the ACIP makes the recommendations, it is up to the state to decide whether the vaccine will be mandated for children upon entry into school or if Medicaid will cover the cost of the vaccine. Should a state decide to require vaccination upon entering school, legal exemptions due exist on the basis of medical, religious, or philosophical grounds, which also vary from state to state (CDC, 2006d; National Vaccine Information Center, 2006). As is the case with most vaccinations of individuals 18 and under, parental consent is required. This is a dilemma as most states will provide family planning and STD preventive services to young adults without parental consent. The facilities that do so may find themselves in a quandary as they will not be able to provide their patients with an effective form of STD prevention.

Extensive efforts must also be made to educate the public about the pervasiveness of HPV and advantages of vaccination. Thus, if both men and women believe they are at risk for becoming infected with HPV, and perceive HPV infection as severe, they may be more likely to receive a vaccine that prevents HPV. These conclusions speak to the importance of finding innovative ways to educate young men and women, no matter the age and sexual experience, about the prevalence and consequences of HPV.

Lastly, it is important to note that although an effective vaccine is a major development in the prevention of HPV and cervical cancer, it should not replace other prevention strategies such as routine cancer screening and practicing safer sex. Women should continue to get Pap tests as the vaccine will not protect against all types of HPV; thus 30% of cervical cancers and 10% of genital warts will not be prevented. Rather than replacing previous cervical cancer prevention

programs, the administration of an HPV vaccine at the primary prevention level should lead health professionals to re-examine secondary prevention efforts such as the existing screening procedures and guidelines.

APPENDIX A

EXAMPLE SURVEY

The purpose of this research study is to determine the acceptability of the HPV (Human Papillomavirus), vaccine among university students. For that reason, we will be surveying University of Pittsburgh students and asking them to complete a brief (approximately 10 minutes) questionnaire. If you are willing to participate, our questionnaire will ask about your background (e.g., race, ethnicity, age, years of education), as well as your feelings concerning the HPV vaccine. There are no foreseeable risks associated with this project, nor are there any direct benefits to you. You will not be paid for your participation, although you will receive a \$1 PA lottery ticket as a token of our appreciation for completing this survey. This is an entirely anonymous questionnaire, and so your responses will not be identified in any way. All responses are confidential, and results will be kept under lock and key. Your participation is voluntary, and you may withdraw from this project at any time. This study is being conducted by Melissa Jones, who can be reached at 412.901.3073 or maj17@pitt.edu, if you have any questions.

You must be at least 18 to complete this survey.

Thank you for taking the time to take this survey. Your answers are very important to us.

HPV is a sexually transmitted virus that can cause genital warts or cancer.

1. How knowledgeable would you describe yourself when it comes to Human Papillomavirus or HPV?

- Extremely Knowledgeable** **Very knowledgeable** **Somewhat knowledgeable** **Not at all knowledgeable**

The following are some specific questions about an HPV vaccine. Right now a vaccine for HPV is not available, but is in the clinical trial stage. We are interested in how people might feel about these vaccines should we get them. So for now, please pretend the vaccine is available.

2. Have you ever been told that you have HPV? (1) **Yes** (2) **No**

3. Have you ever been told that you have genital warts? (1) **Yes** (2) **No**

4. Has anyone that you were close to ever had HPV (family, friends, significant others)?
(1) **Yes** (2) **No** (3) **Don't Know**

5. If you do not get an HPV vaccine, what do you think your chances are of getting HPV sometime in your life (or in the future)?

- (1) **0 to 20%** (2) **21-40%** (3) **41-60%** (4) **61-80%** (5) **81%-100%**

6. How likely is it that you would get a complication (i.e. warts or an abnormal Pap smear) from HPV if you became infected with it?

- (1) **0 to 20%** (2) **21-40%** (3) **41-60%** (4) **61-80%** (5) **81%-100%**

7. How upset would you be if you were told that you:

a) Have genital HPV but you have no symptoms?

- (1) **Worst thing that could happen** (2) **Extremely upset** (3) **Very upset** (4) **Somewhat upset** (5) **Not at all upset**

b) Have genital warts?

- (1) **Worst thing that could happen** (2) **Extremely upset** (3) **Very upset** (4) **Somewhat upset** (5) **Not at all upset**

8. How severe do you think genital HPV infection is for yourself?

(1) **Extremely severe** (2) **Very severe** (3) **Severe** (4) **Somewhat severe** (5) **Not at all severe**

9. How severe do you think genital HPV infection is for men?

(1) **Extremely severe** (2) **Very severe** (3) **Severe** (4) **Somewhat severe** (5) **Not at all severe**

10. How severe do you think genital HPV infection is for women?

(1) **Extremely severe** (2) **Very severe** (3) **Severe** (4) **Somewhat severe** (5) **Not at all severe**

11. Please state whether you agree or disagree with the following statements:

	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
a. HPV is not serious enough for a vaccine.	(1)	(2)	(3)	(4)	(5)
b. HPV can be asymptomatic.	(1)	(2)	(3)	(4)	(5)
c. HPV can spontaneously resolve completely without treatment.	(1)	(2)	(3)	(4)	(5)
d. Greater than 50% of sexually active college students will have HVP once during college.	(1)	(2)	(3)	(4)	(5)
e. I can use condoms less with my partners if I get an HPV vaccine.	(1)	(2)	(3)	(4)	(5)
f. I may get HPV as a result of the vaccine.	(1)	(2)	(3)	(4)	(5)
g. Getting the HPV vaccine would make me sick.	(1)	(2)	(3)	(4)	(5)

12. Assuming the HPV vaccine was available now, how likely would you be to get the vaccine if:

	Extremely likely	Somewhat likely	Unsure	Somewhat unlikely	Extremely unlikely
a. It prevented all HPV	(1)	(2)	(3)	(4)	(5)
b. It prevented cervical cancer in women, but did not prevent genital warts	(1)	(2)	(3)	(4)	(5)
c. It prevented genital warts, but did not prevent cervical cancer in women	(1)	(2)	(3)	(4)	(5)
d. It prevented both genital warts and cervical cancer	(1)	(2)	(3)	(4)	(5)

Would the following potential features make you less likely or more likely to get an HPV vaccine?

	Much less likely to get	Slightly less likely to get	Neutral	Slightly more likely to get	Much more likely to get
13. Having to pay \$50 for the HPV vaccine myself	(1)	(2)	(3)	(4)	(5)
14. Having the HPV vaccine be free	(1)	(2)	(3)	(4)	(5)
15. The HPV vaccine would work in only 70% of persons	(1)	(2)	(3)	(4)	(5)
16. Family or friends would know that I got the HPV vaccine	(1)	(2)	(3)	(4)	(5)
17. The HPV vaccine was recommended to me by my doctor	(1)	(2)	(3)	(4)	(5)
18. The HPV vaccine was recommended to me by my spouse/partner	(1)	(2)	(3)	(4)	(5)
19. The HPV vaccine was recommended to me by my friends	(1)	(2)	(3)	(4)	(5)
20. The HPV vaccine was recommended to me by my parents	(1)	(2)	(3)	(4)	(5)



THIS PAGE IS FOR WOMEN ONLY. MEN PLEASE GO TO THE NEXT PAGE.

21. Have you ever had an abnormal Pap smear? (1) **Yes** (2) **No**
22. Have you ever had a colposcopy? (1) **Yes** (2) **No**
23. Have you ever had treatment for dysplasia (e.g. excision, LEEP)?
(1) **Yes** (2) **No** (3) **Don't Know**
24. Has anyone in your immediate family (e.g. Parents, Siblings) ever had cervical cancer?
(1) **Yes** (2) **No** (3) **Don't know**
24. How upset would you be if you were told that you have an abnormal Pap smear due to HPV?
(1) **Worst thing that could happen** (2) **Extremely upset** (3) **Very upset** (4) **Somewhat upset** (5) **Not at all upset**



Finally, please tell us a little bit about yourself.

25. Current Age: _____ (years)

26. Sex/Gender: (1) **Male** (2) **Female**

27. Current year in College:

(1) **Freshman** (2) **Sophomore** (3) **Junior** (4) **Senior** (5) **Grad Student** (6) **Other**

28. Ethnicity (please check one):

(1) **Non-Hispanic** (2) **Hispanic or Latino** (3) **Unknown or prefer not to answer**

29. Race (please circle all that apply):

(1) **American Indian or Alaska Native**

(4) **Black or African American**

(2) **Asian**

(5) **White**

(3) **Native American or Other Pacific Islander**

(6) **Unknown or prefer not to answer**

30. Current relationship status (please check one):

(1) **Not dating**

(5) **Single, never married**

(2) **Dating, no specific partner**

(6) **Married**

(3) **Dating, one steady partner (not living together)** (7) **Divorced/Separated**

(4) **Dating, one steady partner (living together)** (8) **Widowed**

31. Have you ever had:

a.) vaginal or anal sex? (1) **Yes** (2) **No**

b.) oral sex? (1) **Yes** (2) **No**

If yes to either question, please continue on. If no to both questions, please stop.

Thank you very much for your time. We really appreciate it.

32. You are sexually experienced with (circle only one):

(1) **The opposite sex**

(2) **The same sex**

(3) **Both**

33. In your life how many different people have you had sexual intercourse with? _____

34. Have you ever had a sexually transmitted disease (Chlamydia, Trichomonas (trich), Gonorrhea (GC), Pubic lice/"crabs", Genital herpes, Syphilis, Condyloma (genital warts), Human papilloma virus (HPV))? (1) **Yes** (2) **No**

That's it! You're done! We appreciate your willingness to answer these questions.



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