

## Sexual Health Variables as Predictors of Vaccination against the Human Papillomavirus among Female College Students.

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### Abstract

Recent strides have been made in developing vaccines to prevent contraction of the Human Papillomavirus (HPV), which is currently the most prevalent sexually transmitted disease in the United States. This study looked to investigate seven sexually relevant variables hypothesized to be related to a young woman's choice to receive the Gardasil® vaccine in order to prevent HPV contraction via a cross sectional survey. In a sample of 77 undergraduate women, we investigated the relationship between receipt of Gardasil® and the following variables: knowledge regarding HPV, relationship status, seeking gynecological services, having received an abnormal PAP smear, sexual activity status, number of sexual partners, and concern about contracting HPV. Logistical regression analysis and independent groups t-test revealed that none of these factors were related to actual receipt of the HPV vaccine in this sample. These results suggest the need for more research regarding potential practical barriers to HPV vaccination.

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### Human Papillomavirus And Vaccination: A

#### Review of the Literature

Within the United States, the human Papillomavirus (HPV) is the most common sexually transmitted infection (STI). In fact, approximately 20 million Americans are infected with HPV. Around 50% of these incidences are among adolescents and young adults between the ages of 15 and 24. Furthermore, by the age of 50, 80% of females will have contracted some strand of the HPV virus (Center of Disease Control and Prevention, 2008). There is a strong body of research indicating that subsets of HPV cause cervical cancer, with high-risk subtypes accounting for between 70 to 100% of cervical cancers cases (Bayas, Costos & Munoz, 2008; Walboomers et al, 1999; Zimet et al, 2000). In light of the relationship between HPV and cervical cancer, the high prevalence of HPV serves as a significant health threat.

The Food and Drug Administration approved Gardasil ® in June 2006 and Cervarix ® in October 2009 for the prevention of HPV strain types 6, 11, 16 and 18; strains that account for approximately two-thirds of all cervical cancer cases (Crosby, Schoenberg, Hopenhayn, Moore, & Melhan, 2007; Gerend & Magloire, 2008; GlaxoSmithKline, 2009). These vaccinations have been found to be most effective in preventing the indicated strains of HPV in patients who have not been previously exposed to them. Therapeutic effects have not been demonstrated in females already infected with these specific strains of HPV. Subsequently, current recommendations suggest that females be vaccinated prior to their first sexual encounter, with guidelines specifying ages 11 or 12, though the vaccine is given to females up to age 26 (Center for Disease Control and Prevention, 2008). Over 26 million doses of Gardasil ® were distributed within the United States as of September 1, 2009. During this

same time frame, 15,037 adverse events following Gardasil® vaccinations were reported within the United States, with 93% of these reports considered non-serious (Center for Disease Control and Prevention, 2009).

Since the first HPV vaccine became licensed, there has been increasing debate as to whether girls should be required to have the vaccination. In 2007, Texas became the first state to pass a mandate, specifying that all females entering sixth grade, with some exceptions, receive the vaccine. Although Texas' order was ultimately overridden, within at least 41 states, public officials have introduced legislation to require, provide education, or fund HPV vaccination. At least 19 states have passed such laws (National Conference of State Legislatures, 2009).

These sanctions have resulted in further strengthening of public opinion both opposing and favoring the mandate of vaccines for HPV. In fact, despite the evidence suggesting that the HPV vaccine may help to prevent cervical cancer (Centers for Disease Control and Prevention, 2008), many individuals have moral objections to a mandate of a vaccine preventing an STI. Further, financial concerns around a mandate have arisen, including issues around uninsured youth and whether to require insurance plans to cover the vaccine (National Conference of State Legislatures, 2009). Thus, this debate remains fervent and continues to evolve as more information around HPV vaccination is generated.

Akin to the increased focus on legislation around HPV vaccination, a body of literature suggests that awareness and knowledge of HPV has steadily increased over the past fifteen years. In fact, a 1992 study found that 87% of 263 college-aged women surveyed had either never heard of HPV or were uncertain of whether they had heard of the virus (Vail-Smith & White, 1992). Approximately eight years later, Baer, Allen, and Braun (2000) surveyed 1,471 freshman undergraduate students in New England, finding that 29.1% of men and 35.3% of women knew of HPV infection of the cervix. Most recently, Gerend and Magloire (2008) investigated knowledge of HPV in a sample of

124 college students between 18 and 26 years of age (52% female). The researchers found that more than 75% of their female participants had heard of HPV, a sharp contrast to Vail-Smith and White's findings in 1992.

As a result of the novelty of HPV vaccinations, researchers have explored factors that may influence whether individuals are interested in receiving a vaccine. Prior to the introduction of the HPV vaccines, research suggested that acceptance of a hypothetical HPV vaccine was related to several variables, including the efficacy of the vaccine, physician recommendations, and cost (Zimet et al., 2000). Since the inception of an actual vaccine, Gerend and Magloire (2008) report that women who were sexually active, reported multiple sexual partners, and felt vulnerable to the HPV infection had the greatest interest in the HPV vaccine. Similarly, Crosby, Schoenberg, and Hopenhayn's (2007) study indicated that exposure to HPV, including having sexual relations over the past 12 months, receiving an abnormal PAP smear, and having a STI, is a significant predictor of vaccine acceptance for undergraduate women. Within this framework, Crosby and colleagues found the strongest relationship between sexual activity and acceptance of a vaccine. Ultimately, this body of literature suggests that several factors may be related to an individual's perceptions of the HPV vaccines.

Unfortunately, limited research has been conducted examining predictors of actual HPV vaccination behaviors. For instance, two studies conducted after Gardasil's® release (Crosby, Schoenberg, Hopenhayn, Moore, & Melhan, 2007; Gerend, & Magloire, 2008) explored only interest in the HPV vaccine and intent to be vaccinated against HPV respectively. Further, Chao and colleagues (2009) explored potential predictors of completing Gardasil's® 3-dose HPV4 vaccination series. The sample group included 34, 193 females between the ages of 9 and 26 recruited from a managed care organization who had received the initial inoculation. Forty-one percent of 9 to 17 year-olds and 47% of 18 to 26 year-olds completed the 3-dose regimen. Results specifically

suggested that African Americans and individuals with lower levels of education were less likely to complete the series of three vaccinations. However, having a history of sexually transmitted infections, abnormal PAP test results, and immune-related conditions were not found to be related to regimen completion behavior in this sample. In light of the relationship between non-adherence to the 3 vaccinations and lowered efficacy (Center for Disease Control and Prevention, 2008), Chao et al. underscores the importance of identifying factors related to initiating and completing the vaccination series.

### **The Current Study**

Ultimately, limited research has investigated predictors of HPV vaccination behaviors, with no study to our knowledge specifically examining actions towards first receiving a vaccine. For this reason, the present study aims to expand on the current body of research by investigating factors associated with actions taken to receive the Gardasil® vaccination within a female, undergraduate population (At the time the current research was conducted, Gardasil® was the only FDA approved vaccine for HPV therefore, mention of Cervarix® was not indicated). Crosby et al. (2007) suggest that being sexually active, previously having an STI, and an abnormal PAP smear are associated with increased acceptance of HPV vaccination. Similarly, Gerend & Magloire (2008) found that being sexually active, having multiple partners, and perceived vulnerability to HPV were related to greater interest in vaccination. Expanding on these results, this research aimed to investigate whether factors associated with acceptance of and interest in HPV vaccination would also be associated with action taken to receive the vaccination within a sample of collegiate women. Potential predictors include being sexually active, relationship status, receiving gynecological services, abnormal PAP smear, concern over contracting HPV, number of sexual partners, and HPV knowledge. Researchers specifically hypothesized that being sexually active, having at least one abnormal PAP smear, not being in a monogamous relationship, having knowledge about HPV, being concerned about contraction and seeking regular gynecological

services would all significantly predict action taken towards vaccination. Due to the previously mentioned legislative changes that are in process to make the vaccine mandatory in some states, the population of females within the current study (from an urban area in a city without such mandates) may be more likely to have received the vaccine on their own volition. Therefore data from these participants can more clearly inform us about the factors influencing this particular health seeking behavior.

### **Methods**

The research presented here is a cross sectional survey study conducted in a university setting with female participants. Data was collected throughout the spring academic semester of 2007.

### **Sample**

Seventy-seven female participants (18-25 years old) were recruited from undergraduate psychology classes at an urban Catholic University in the Central Northeast. Psychology doctoral students approached undergraduate classes in which professors had agreed to provide class credit for research participation and briefly explained the rationale for the study. The recruiters explained that the study was an anonymous online survey collecting information about undergraduate females' sexual behaviors and knowledge. Eligible participants were told that they would be given extra credit for their participation and were provided with a flyer, which reiterated the details of this study and provided instructions to access the online survey. The procedure and recruitment process for this study was approved by the University's Institutional Review Board prior to data collection. The average age of the sample was 20.6 years (SD = 4.1). The majority of the sample was Caucasian (81%), heterosexual (92.4%), and Roman Catholic (74.2%). The sample racial characteristics are consistent with the published demographics of the university from which the sample was recruited, as census indicated that 80% of the 2006 incoming student body identified as Caucasian. However this university provides no information regarding religion or sexual orientation of its student

body, thus this information was not available for comparison to our sample. The total number of undergraduate women enrolled in daytime courses at this institution is approximately 1900, however this pool was greatly reduced for this study, as many professors were not willing to provide extra credit for research participation and this was the only incentive offered. Of this sample, 39% had received the HPV vaccination and 61% had not received the vaccination.

### Measures

*HPV Vaccination Status.* HPV vaccination status was measured by one self-report question asking whether the participant had either a.) received the HPV vaccine, b.) begun the HPV vaccination process, c.) had an appointment or d.) did not receive the vaccination. Responses were collapsed into two categories: received the vaccine or have not received the vaccine. Twenty-seven participants indicated that they had received the HPV vaccination. Three participants indicated that they had begun the HPV vaccination process. Based on this response pattern, both participants who reported they had received all three of the HPV vaccine injections and participants who reported they had begun the vaccination process were considered to have received the vaccine. All other responses indicated that the participant had not yet received the vaccine.

*Sexually relevant variables.* Sexually relevant variables predicted to be associated with receiving the HPV vaccine included 1) sexual activity status, 2) relationship status, 3) annual gynecological exam status, 4) abnormal PAP smear history, 5) concern over contracting HPV, 6) number of sexual partners, and 7.) HPV knowledge. The first six variables were measured through six self-report items about sexual health. A sample item is "Have you ever had an abnormal PAP smear?" Five of the items were coded as dichotomous variables (ie-Yes/No answer choices) indicating the presence or absence of the sexual health behavior. The sixth variable, sexual partners, was coded as a continuous variable representing the number of sexual partners a participant reported having been with at the time of this survey.

*HPV knowledge scale.* HPV knowledge was measured by a scale created by the authors of the study to reflect participants' knowledge about prevalence, risk of contraction, symptoms, and effects of HPV. While this scale has not been formally validated, a concerted effort was made to ensure that the items in this scale were consistent with readily available information to this age group. The scales consisted of 13 items, which were generated from information readily accessible at local health care clinics (eg- printed HPV education pamphlets) or on health related websites in order to ensure the applicability of the questions asked. A sample item is "True,False or Unsure: HPV can cause cervical cancer." The responses were coded so each correct answer received a score of one, with incorrect or "unsure" answers coded as zero. The scale was scored by summing the number of correct answers. The scores ranged from 0-13, with higher scores reflecting higher levels of HPV knowledge. See Appendix A for full scale.

### Results

Categorical variables of interest were analyzed using a logistical regression, while continuous variables were analyzed using independent groups t-tests. The different variables are discussed below. Sexual Activity Status, Relationship Status, Annual Gynecological Exam Status, Abnormal PAP Smear History, and Concern Over Contracting HPV.

A binary logistic regression was performed with HPV vaccination status as the dependent variable and the five categorical sexual health variables, sexual activity status, relationship status, annual gynecological exam status, abnormal PAP smear history, and concern over contracting HPV as predictor variables. Results indicate that the model did not significantly predict receiving the HPV vaccination (omnibus chi square = 6.90, df = 5, p = .229). The model successfully predicted 85.7% of individuals who did not receive the vaccination, but only correctly predicted 30% of individuals who did receive the vaccination. None of these categorical sexual health predictor variables (sexual activity status, relationship status, annual

gynecological exam status, abnormal PAP smear history, or concern over contracting HPV) significantly predicted whether a participant had received the HPV vaccination. Although not significant, there was a minor trend toward those who seek gynecological services being more likely to receive the vaccination. These authors

hesitate to venture an interpretation of this finding, however, as the trend is not a strong one and there may be many confounding factors influencing this statistic. Table 1 provides the coefficients and probability values for each predictor variable.

Table 1 Categorical Predictors of Action to Receive HPV Vaccination

Predictor Variables	B	Exp (B)	Wald	df	Sig.
Sexually active	-0.71	2.01	0.81	1	.368
Relationship status	-0.71	0.49	0.15	1	.493
Gynecological services	-1.36	0.26	2.81	1	.094
Abnormal PAP smear	-0.02	0.98	0.001	1	.975
Concern over HPV	0.17	1.19	0.25	1	.619

Table 2 Continuous Predictors of Action to Receive HPV Vaccination

Predictor Variables	t	df	CI Lower	CI Upper	Sig.
Sexual Partners -equal variances assumed	-.16	77	-2.74	2.33	.87
Sexual Partners- equal variances not assumed	-.18	76.48	-2.51	2.1	.86
HPV Knowledge-equal variances assumed	-1.6	77	-2.1	0.26	.13
HPV Knowledge- equal variances not assumed	-1.5	59.27	-2.12	0.28	.13

CI= 95% Confidence Interval of the Difference

**Sexual Partners**

An independent groups t- test was conducted to determine whether number of sexual partners was related to HPV vaccination. Results indicated that the relationship between number

of sexual partners and to receiving the HPV vaccination was not statistically significant  $t(76) = -.163, p = .87$ .

## HPV Knowledge

An independent groups t-test was conducted to determine whether HPV knowledge was related to HPV vaccination. Results also indicated that the relationship between HPV knowledge and action to receive vaccination was not statistically significant  $t(76) = -1.55, p = .13$ .

## Discussion

Studies conducted by Crosby et. al and Gerend & Magloire following the release of Gardasil® found that intent to receive the vaccine was related to a number of sexually relevant variables, such as perceived vulnerability to contracting HPV, having received an abnormal PAP smear and number of sexual partners. The present study takes this investigation a step further, and looked to examine whether similar sexually relevant variables would be related to actual HPV vaccination behaviors, rather than intentions to receive the vaccine in the future. At the time of this data collection, the only HPV vaccine publicly available was Gardasil ® (manufactured by Merck and Co.), and thus this study focused solely on this particular vaccine. The seven variables that were included in this study were: relationship status, HPV related knowledge, number of sexual partners, concern about contracting HPV, sexual activity status, receiving an abnormal PAP smear, and seeking gynecological services. Our findings could not detect a relationship in any direction between these identified sexually relevant variables and HPV vaccination behaviors in this sample of college women, as all statistical analysis yielded non-significant results. This suggests that while intent to receive this vaccine may be related to these seemingly obvious sexually relevant variables, the relationship between these variables and behavioral follow-through may not be as straightforward.

This discrepancy between intent and actual behavior is not new to health psychology. Some research suggests that intention is not always a reliable predictor of certain health behaviors. Albarracin et al.'s (2001) meta-analysis of studies that tested the Theories of Planned Behavior and Reasoned Action for condom use found that, on closer investigation, intention to

use condoms was not as strong of a predictor of actual condom use as previously assumed. Studies on condom use that were prospective in nature illustrated weaker relationships between intent and behavior than studies that were retrospective, suggesting that people may formulate their intentions based on past behavior (rather than the other way around), thus overestimating the independent effect intention may have on this sexual health behavior.

The question remains, why are these sexually relevant variables, which have been shown to predict intent to receive this vaccine in previous studies, not predictive of HPV vaccination behaviors in the current study? This study is limited by the somewhat narrow focus of our variables of interest (ie- sexually relevant factors) and there may be a number of more practical variables related to HPV vaccination in this population which were not assessed in this study. For example, the student health center at the university in question does not provide HPV vaccination, necessitating students to seek out gynecological services in the community if they wanted this medication, thus creating an additional barrier for those students who receive medical services exclusively at this center for transportation or financial reasons. While it is not possible to know definitively where the women in our sample receive their medical services, it is reasonable to expect that some of our participants may rely on this facility for medical care. This university reports that 86% of incoming freshman reside in on campus housing and 51% of incoming freshman are from out of state, suggesting this may be a significant issue for this population. Related to this, it is possible that simply whether or not a young woman's health care provider recommends and carries the vaccine greatly influences whether or not she receives it and health care providers at this Catholic institution may be less likely than health care providers in the general community to recommend this vaccine (although this could not be confirmed by the these authors).

Additionally, the cost of the vaccine may be prohibitive to many college students, even those willing/able to seek out care providers in the community, and this financial consideration was not assessed in this study. This last point seems

plausible when considering our population, as 22% of the 2006 incoming students at the institution we pulled this sample from were eligible for Pell Grants, suggesting limited financial resources for a significant subset of the students at this university. The development of new HPV vaccines, most notably the recently approved Cervarix® (manufactured by GlaxoSmithKline) may help to drive down the cost of receiving these important medications and help alleviate this barrier in the future.

There is some evidence in earlier studies of disease prevention that practical barriers may contribute to a lack of preventative sexual health care. Consistent with these hypotheses, the results of a 1999 focus group (Oliva, Rienks, & McDermid, 1999) consisting of women at high risk for HIV found that high monetary cost and geographic inconvenience (ie- having to travel significant distances to receive medical services) were identified as barriers to receiving sexual health care.

### Limitations

A major limitation of this study was our relatively small sample size, with only 27 participants (in a sample of 77) having received the vaccine. Thus, it is possible that our study did not have sufficient power to detect the relationships these variables may have with the health behavior of receiving the HPV vaccine. While a sample this size is not ideal for the analysis conducted, we hope that this study will be replicated on a much larger scale investigating a wider range of variables to add to the body of knowledge in this area. Additionally,

our sample was collected at a Catholic university, and our sample may differ from college-aged women at state or private secular universities. Replication of this study in a different setting would be necessary in order to control for these possible confounds.

Finally, this study did not measure the participant's intent to receive the HPV vaccine but rather the actual health behavior. Measuring intent may have provided a more clear contrast to previous HPV vaccine research, which focused on this construct. Comparison between variables related to intent to receive vaccination and variables related to action to receive vaccination may provide information college women's barriers to vaccination.

### Implications and Future Research

These findings highlight the need to consider more practical variables and barriers to HPV vaccination. While individual sexually relevant variables, such as relationship status or a young woman's perception of risk, are likely related to her intent to engage in a health behavior, they may not be enough to predict her actual behavioral follow through. In short, intent does not always predict behavior. This may be the case with the HPV vaccine, which may present many practical barriers for a young woman (cost, attainability, etc.). Isolating and understanding what variables might keep a college woman from engaging in this important health behavior should be the next step in this line of research. Understanding this will be critical to effectively disseminating the vaccine.

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## Appendix A

### HPV Knowledge Scale

Please answer "True" "False" Or "Unsure"

- 1) You can't get HPV from having oral or anal sex
- 2) I would be able to tell if my partner had HPV
- 3) HPV often has no visible symptoms
- 4) Condoms help to protect against HPV
- 5) Birth control pills protects against STDs
- 6) HPV and herpes are the same thing
- 7) HPV can cause genital (venereal) warts
- 8) HPV can cause cervical cancer
- 9) There is no standard test for high risk strains of HPV for men
- 10) A standard blood test screens for HPV
- 11) HPV is rare in the United States
- 12) I would know if I had HPV because I would have symptoms
- 13) HPV is more dangerous for women than it is for men