

# Viral Sexually Transmitted Disease Vaccine Acceptability Among College Students

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**Background and Objectives:** Vaccines are an important strategy for the control of infectious diseases; however, they are only successful if accepted. The object of this study was to examine factors that could affect vaccine acceptance among college students for 2 sexually transmitted diseases (STDs).

**Goal:** The goal was to examine the impact of gender and specific rationales on STD vaccine acceptance using health behavior theories.

**Study Design:** Participants completed a questionnaire regarding attitudes about hypothetical STD vaccines.

**Results:** Seventy-four percent of each group endorsed acceptance. Factors influencing genital herpes vaccine acceptance were parents' feelings, belief in vaccination, universal recommendation, numerous partners, a belief that acquisition makes finding partners difficult, and low cost. Human papillomavirus vaccine factors were parents' feelings, universal recommendation, numerous partners, safety, and low cost.

**Conclusion:** Our results indicate that most college students would accept STD vaccination. Factors affecting acceptance were similar for both pathogens. The results suggest acceptance will be positively affected by health policies encouraging universal vaccination.

SEXUALLY TRANSMITTED DISEASES (STDs) continue to be a critical public health issue despite myriad efforts to educate the public about preventive practices (ie, "safer sex" and delaying the onset of sexual intercourse) and the proliferation of antibiotics and antivirals to treat these infections.<sup>1</sup> There is particular concern about the large number of adolescents and young adults who acquire STDs. Of the 15 million new cases in the United States each year, approximately 4 million are in adolescents.<sup>2</sup> Genital herpes and human papillomavirus (HPV) are the 2 most common viral STD infections.<sup>3</sup>

Vaccines are an effective way to prevent infectious diseases, yet the existence of vaccines does not automatically lead to acceptance.<sup>4,5</sup> Given the social stigma associated with STDs, researchers have posited that acceptance of STD vaccines might be particularly low, perhaps even lower than for childhood diseases. For example, concern about social stigma has often caused healthcare providers to avoid addressing the sexual transmission of hepatitis B in discussions or pamphlets promoting the hepatitis B vaccine.<sup>6,7</sup> Thus, it has been suggested that healthcare providers could focus

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on a genital herpes vaccine as preventing neonatal herpes or an HPV vaccine as preventing cancer.

Recent research has demonstrated promise for a vaccine for both genital herpes and HPV.<sup>8,9</sup> Thus, it is timely to examine how the presentation of the vaccine and health belief factors affect the likelihood of acceptance for both genital herpes and HPV vaccines. The purpose of the current study was to:

1. Examine the impact of rationales for genital herpes vaccination that focused on an STD message, a reproductive health message, and a combination of both messages, and to determine if there was an interaction between rationale and gender in terms of acceptance.
2. Examine the impact of rationales for HPV vaccination that focused on an STD message, a reproductive health message, and a combination of both messages, and to determine if there was an interaction between rationale and gender in terms of acceptance.
3. Examine health beliefs as identified by the Theory of Reasoned Action,<sup>10</sup> as well as other factors to determine their impact on genital herpes and HPV vaccine acceptability. These variables include perceived severity and susceptibility, absence of barriers to the behavior, social influences, and vaccine strategies.
4. Compare the 2 pathogens for levels of acceptance.

This article extends our understanding of acceptance for genital herpes and HPV vaccination. We think this is the first time that the 2 pathogens have been compared.

## Methods

### Procedure

Participants were recruited from introductory psychology courses at a midwestern public university. College students responded to advertisements in class and were given research credit for participation. Sixty-eight percent of participants were either freshmen or sophomores. The students completed the questionnaire in writing. The 6 versions (3 different rationales for each

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TABLE 1. Ramification Messages

**Genital herpes STD ramification message**

"We are recommending that all people who are sexually active or considering becoming sexually active get this vaccine. One in five adults are infected with the virus that causes genital herpes. Most people who have genital herpes do not know it because they have no symptoms; however, some people could have sores that they find painful. Further, a person could be contagious even without symptoms, thus there is no way to know when you are at risk for transmission or acquisition during sexual contact."

**Genital herpes reproductive health ramification message**

"We are recommending that all people of childbearing age get this vaccine. One in five adults are infected with the virus that causes genital herpes. Most people who have genital herpes do not know it because they have no symptoms; however, some people could have sores that they find painful. Genital herpes can be passed onto an unborn baby, potentially causing serious physical difficulties for the baby, such as blindness, mental retardation and even death."

**HPV STD ramification message**

"We are recommending that all people who are sexually active or considering becoming sexually active get this vaccine. It is estimated that over 25 million people are infected with HPV. Most people who have HPV do not know it because they have no symptoms; however, some people with some types of HPV can develop warts. Further, a person could be contagious even without symptoms; thus there is no way to know when you are at risk for transmission or acquisition during sexual contact."

**HPV reproductive ramification message**

We are recommending that all people of childbearing age get this vaccine. It is estimated that over 25 million people are infected with HPV. Most people who have HPV do not know it because they have no symptoms; however, some people with some types of HPV can develop warts. It is believed that some types of HPV lead to almost all cancers of the genital region. In women, it is the most important risk factor linked to cervical cancer, which affects a small portion of the population. In men, it has been linked to penile cancer, a rare disorder.

pathogen) of the questionnaire were administered in a random order. The institutional review boards of the University of Cincinnati and Cincinnati Children's Hospital Medical Center approved the study.

*Measures*

The questionnaire was based on questionnaires used in previous studies.<sup>11-13</sup> It included an STD message, a reproductive message, and a combined message as rationales for receiving the vaccine. These rationales were developed based on clinical experiences in explaining the hepatitis B vaccine. The rationales for the genital herpes and HPV vaccine are presented in Table 1.

The questionnaire assessed demographic information, sexual history, knowledge of the disease, health beliefs (perceived susceptibility, severity, barriers, influence of significant others, and vaccine strategy), and whether the participant would accept the genital herpes or HPV vaccine. Demographic and sexual history information examined included gender, race/ethnicity, current relationship status, sexual experience, and number of lifetime partners. Knowledge was computed as the sum of 14 items for either genital herpes or HPV. Susceptibility was measured by having participants rate, on a 3-point scale, their current risk (not at all, a little, or a lot) and on a 5-point scale the percentage likelihood of future acquisition (0-5%, 6-25%, 26-50%, >50%). Severity was measured by having the college students rate, on a 4-point scale, "how they would feel" if they acquired either genital herpes or HPV ranging from "not upset at all" to "worst thing that could happen," and whether they thought they would have difficulty finding a long-term sexual partner if infected. Absence of barriers was assessed by having the college students rate, on a 3-point scale, the importance of low cost (not a factor, a little important, very important) and how they are affected by shots (not a bother, bothers a little, bothers a lot.) To assess the college students' perception of the beliefs of persons important in their lives, they were asked to rate the likelihood that parents, partners, and health-care providers would encourage vaccination. Finally, they were asked whether "everyone" should receive the genital herpes or HPV vaccine and how important they believed vaccination was in general (3-point scale: not important, somewhat important, highly important).<sup>12</sup>

Vaccine acceptability was measured by having the participant

respond "yes" or "no" to the question "If a genital herpes (HPV) vaccine is made available to you, do you think you will decide to get the vaccine?"

*Statistical Analysis*

Logistic regression was first used to analyze the impact of gender, rationales, and gender-rationale interactions on genital herpes and HPV vaccine acceptance. Next, for each vaccine, logistic regression was used as a screening device to determine which additional independent variables (demographic and sexual history, knowledge, and health beliefs) were related to vaccine acceptance. Logistic regression was chosen because the dependent variable was dichotomous. Variables that were statistically significant at the 0.05 level during the screening were then entered into a model with the answer to the vaccine-acceptance question (yes/no as the outcome variable).

**Results***Genital Herpes Sample*

A total of 259 undergraduate students completed the genital herpes versions of the questionnaire. Eighty-seven received the STD message, 87 received the reproductive health message, and 86 received the combined message. Table 2 provides demographic data for the sample. The 3 groups did not differ by sexual experience, age of first intercourse, number of sexual partners, or current dating status (data not shown).

*Rationale for Vaccination and Rationale by Gender Interaction*

When asked if they would accept a vaccine for genital herpes, 74% of the students responded yes. Logistic regression was used to determine the effects of rationale, gender, and rationale-gender interactions. There were no statistically significant effects for rationales, gender, or rationale-gender interactions.

*Logistic Regression Models of Genital Herpes Vaccine Acceptance*

Logistic regression models were then developed to determine which individual factors significantly affected acceptance of a

TABLE 2. Demographic Characteristics and Their Relationship to Genital Herpes Vaccine Acceptance

	Student (%)	Wald Chi-Square	P*
Gender			
Female	50		
Male	50		
		0.02	0.89
Race			
Black	13		
White	78		
Other	9		
		9.36	<0.01
Sexually experienced	72	3.93	0.05
No. of lifetime partners			
0	28		
1 or 2	33		
3 or 4	20		
5 or 6	7		
7 or more	12		
		12.75	<0.01
Dating without regular partner	26	10.59	0.01
History of STD	7	0.56	0.45
History of genital herpes	0.5	0.09	0.88
Mean age (y)	20.6	4.84	0.56
Range, 18–54			
Median, 19			

\*Probability that individual factor affected vaccine acceptance.

genital herpes vaccine. Each demographic or predictor variable was placed individually into a logistic regression model. Because there was no significant effect for gender or rationale, the following results are presented for all 259 college students who completed the genital herpes questionnaire (Tables 2 and 3). It should be noted that there was a single outlier, a student whose age was 54 years. Analyses were performed both including and excluding this student; the results were unchanged when the student was excluded so the student's responses were retained in the dataset.

TABLE 3. Factors Affecting Genital Herpes Vaccine Acceptance

	Student (%)	Wald Chi-Square	P*
Currently at risk for acquisition	23	5.26	0.07
High risk (>50%) of future acquisition	62	14.28	<0.01
Difficulty finding partners	87	10.84	<0.01
Belief that acquisition is the worst thing that could happen	19	1.45	0.48
No fear of shots	50	8.14	0.01
Belief that the vaccine is safe	73	25.54	<0.01
Low cost	60	36.15	<0.01
Parents would encourage vaccination	51	28.59	<0.01
Partner would encourage vaccination	61	16.04	<0.01
Healthcare providers would encourage vaccination	86	13.74	<0.01
Belief in the importance of vaccines in general	97	7.29	<0.01
Universal genital herpes vaccine endorsement	53	39.09	<0.01

\*Probability that individual factor affected vaccine acceptance.

TABLE 4. Final Logistic Regression Model of Genital Herpes Vaccination Acceptance Factors

Variable	Parameter Estimate	Standard Error	Wald Chi-Square	P
No. of lifetime partners	-0.58	0.32	9.97	0.02
Difficulty finding partners	-0.68	0.28	5.86	0.02
Feelings of parent	0.53	0.20	6.80	0.01
General vaccine attitudes	-1.34	0.51	6.85	0.01
Universal vaccine endorsement	-0.92	0.21	19.08	<0.01
Low cost	-0.51	0.45	9.28	0.01

Factors significantly affecting vaccine acceptance included the following: 1) race, blacks were more likely to endorse acceptance of the vaccine; 2) sexual experience, subjects who were sexually experienced were more likely to endorse acceptance with a direct relationship to number of partners; those dating without regular partners were also more likely to endorse acceptance; 3) susceptibility, persons who estimated their risk of future acquisition as high were more likely to accept vaccination; and 4) severity, those who thought they would have more difficulty finding a partner if infected were more likely to endorse acceptance. Knowledge and psychologic impact of the disease were not related to vaccine acceptance.

Potential barriers to acceptance that were significant predictors included persons who said that getting shots did not bother them, believed it to be safe, or low cost were more likely to accept the vaccination. Subjective norms were also a factor in vaccine acceptance. Persons who believed their parents, partners, or physicians would encourage vaccination were more likely to endorse acceptance. Persons who endorsed a belief in the importance of vaccines in general and believed in a universal vaccination strategy for genital herpes were also more likely to accept the genital herpes vaccine.

Those variables that were significant individually were entered into a final model. The final model was significant, likelihood ratio chi-squared (9,  $n = 242$ ) = 99.41,  $P < 0.0001$ , Somers'  $d = 0.75$ , and the percentage of concordant pairs was 86.9. Table 4 shows those variables that remained significant in the model. College students were more likely to accept the vaccine as the number of partners they had increased, if they believed that acquisition would make it difficult to find partners, if they felt that parents would encourage vaccination, if the vaccine was low in cost, if they endorsed the belief that vaccines in general are good, and if they endorsed the belief that a universal vaccination strategy for genital herpes was good.

#### Human Papillomavirus Sample

Two hundred fifty-six undergraduate students completed the HPV versions of the questionnaire. Eighty-six received the STD message, 86 received the reproductive health message, and 85 received the combined message. There were 127 male and 129 female participants in the study. Table 5 provides demographic data for the sample. The 3 groups did not differ by sexual experience, age of first intercourse, number of sexual partners, or current dating status (data not shown).

#### Rationale for Vaccination and Rationale by Gender Interaction

When asked if they would accept a vaccine for HPV, 74% of the students responded yes. Logistic regression was used to determine the effects of rationale, gender, and rationale-gender interactions.

TABLE 5. Demographic Characteristics and Their Relationship to HPV Vaccine Acceptance

	Student (%)	Wald Chi-Square	P*
Gender			
Female	50		
Male	50	0.1	0.75
Race			
Black	13		
White	78		
Other	9	0.22	0.9
Sexually experienced	78	1.99	0.16
No. of lifetime partners			
0	22		
1 or 2	34		
3 or 4	15		
5 or 6	10		
7 or more	19	9.45	0.03
Dating without regular partner	26	2.22	0.53
History of STD	10	0.04	0.84
History of HPV	0	N/A	N/A
Mean age (y)	20.2	3.71	0.72
Range, 18–42			
Median, 19			

\*Probability that individual factor affected vaccine acceptance. HPV = human papillomavirus; N/A = not applicable.

There were no statistically significant effects for rationales, gender, or rationale–gender interactions.

#### Logistic Regression Models of Human Papillomavirus Vaccine Acceptance

Logistic regression models were developed following the same process as those of the genital herpes group. Because there was no significant effect for gender or rationale, the following results are presented for all 256 college students who were asked about HPV.

Unlike genital herpes vaccine acceptance, race and sexual experience were not related to HPV vaccine acceptance. However, vaccine acceptance was related to the number of sexual partners, with the higher the number of partners, the more likely the subjects were to endorse acceptance. Health belief factors played a variable role in vaccine acceptance (Table 6). Susceptibility to the disease was a significant predictor of vaccine acceptance. Persons who estimated their current or future risk of acquisition as high were more likely to accept vaccination. Severity and knowledge of the disease were not related to vaccine acceptance.

Potential barriers to acceptance that were significant predictors included persons who said that getting shots did not bother them, believed it to be safe, or low cost were more likely to accept the vaccination. Subjective norms were also a factor in vaccine acceptance. Persons who believed that their parents, partners, or physicians would encourage vaccination were more likely to endorse acceptance. Persons who accepted the HPV vaccine were more likely to endorse a belief in the importance of vaccines in general and a belief in a universal vaccination strategy against HPV.

Those variables that were significant individually were entered into a final model. The final model was significant, likelihood ratio chi-squared (9,  $n = 235$ ) = 117.57,  $P < 0.0001$ , Somers'  $d = 0.82$ , and the percentage of concordant pairs was 90.4. Table 7 provides the information for the variables that remained significant in the

TABLE 6. Factors Affecting HPV Vaccine Acceptance

	Student (%)	Wald Chi-Square	P*
Currently at risk for acquisition	26	17.86	<0.01
High risk (>50%) of future acquisition	62	14.28	<0.01
Difficulty finding partners	84	2.28	0.13
Belief that acquisition is the worst thing that could happen	16	1.64	0.65
No fear of shots	50	12.46	<0.01
Belief that the vaccine is safe	72	30.53	<0.01
Low cost	60	49.17	<0.01
Parents would encourage vaccination	60	31.56	<0.01
Partner would encourage vaccination	66	29.97	<0.01
Healthcare providers would encourage vaccination	86	19.83	<0.01
Belief in the importance of vaccines in general	97	4.83	0.03
Universal genital herpes vaccine endorsement	61	44.63	<0.01

\*Probability that individual factor affected vaccine acceptance. HPV = human papillomavirus.

model. College students were more likely to accept the vaccine as the number of sexual partners they had increased, if they felt that parents would encourage vaccination, if the vaccine was low in cost and safe, and if they endorsed the belief that a universal vaccination strategy for HPV was good.

#### Discussion

The current study extended genital herpes and HPV vaccine acceptability research by examining rationales to determine the effect of various messages on acceptance for a genital herpes or HPV vaccine. Overall, 74% college students responded that they would be likely to accept a vaccine for both genital herpes and HPV; however, there were no rationale effects found. The absence of a benefit from rationale effects (sexual versus reproductive) on vaccine acceptance is similar to the findings of Zimet et al.<sup>5</sup> in which participants were not influenced by differences between sexual and reproductive benefits of a hypothetical HPV vaccine when asked which they would accept. In another study, when examining preferences for HPV vaccines, Hoover et al. found that girls and young women actually preferred a vaccine that targeted the STD rather than cervical cancer.<sup>14</sup> When comparing this result

TABLE 7. Final Logistic Regression Model of HPV Vaccination Acceptance Factors

Variable	Parameter Estimate	Standard Error	Wald Chi-Square	P
No. of lifetime partners	0.21	0.58	9.20	0.03
Feelings of parent	0.59	0.22	7.43	0.01
Universal vaccine endorsement	-1.03	0.22	22.81	<0.01
Low cost	-0.99	0.42	15.69	<0.01
Vaccine safety	0.34	0.42	6.07	0.05

HPV = human papillomavirus.

with the current study, it should be remembered that the current study examined influences on acceptance, whereas Hoover et al. examined preferences for acceptance. The results of the current study provide no evidence that sexual versus reproductive health messages affecting STD vaccination were differentially effective. Thus, care providers need not avoid sexual issues when discussing genital herpes or HPV vaccinations.

Several studies have examined public acceptance for such STD vaccines.<sup>5,12,13</sup> Understanding the participants' rationale for accepting vaccines is important because effectiveness of a genital herpes or HPV vaccine will depend in part on the public's willingness to receive them. Participants in this study were similar not only in their high endorsement rates of vaccine acceptance for each disease, but also in factors that would influence their acceptance. For example, most participants reported that low cost and a universal vaccine strategy were important factors in their acceptance of the hypothetical vaccines. These results are similar to previous studies<sup>5,12,15,16</sup> of genital herpes and HPV vaccines.

The influence of significant interpersonal relationships was also an important factor in vaccine acceptance for either vaccine. Similar to a previous study,<sup>15</sup> students in this study reported that they would be influenced by the feelings of their parents toward STD vaccination. This result also demonstrated the students' willingness to discuss matters of a sexual nature with their parents. This highlights the importance of parental input even among college students, as well as issues related to comfort with sexuality.

This study presents the examination of student attitudes toward genital herpes and HPV vaccinations in an urban midwestern university. The majority of the sample was white. Further studies in other college populations, in which additional minority students could participate, would be advisable to examine the generalizability of the present results. In addition, studies focusing on adolescents attending school-based clinics, military recruits, and forensic populations would provide an opportunity to address higher-risk populations. This study only measures intentions of acceptance for vaccines not yet available; the authors have found no data in the literature to demonstrate the correlation between hypothetical vaccine acceptance and the subsequent actual acceptance. It also used written scenarios that do not provide an established and trusting relationship between healthcare provider and patient. Live vignettes might be another approach to future research.

The results of this study show strong promise for the acceptance of STD vaccines by college students. Presenting the vaccine as preventing sexually related, as opposed to reproductive, problems does not seem to be a deterrent to acceptance. It is important to know that college students are willing to accept a vaccine for an STD because there are still many susceptible individuals in this cohort. However, for an STD vaccine to have the largest impact, vaccination should be given at an earlier age. The acquisition of an STD could have a critical impact on the psychosexual development of college students because they are at an age when they are developing patterns of risk and protective behaviors. Given this, further studies should be done with the parents of prepubescent children to determine their willingness to immunize their children against STDs because the vaccines would be most effective if started before sexual initiation. Given the higher seroprevalence

rates for genital herpes in blacks, it is important to include a strong minority cohort in these studies.

Finally, public health policy should focus on universal STD vaccine strategies because research indicates that this appears to increase vaccine acceptance.<sup>5,15</sup> However, it should be noted that there are multiple factors such as cost, epidemiology, and access to various populations that will need to be considered in formulating the ultimate strategies that will be used to develop vaccine recommendation. Most of the college students in this study stated that they would accept an STD vaccine, suggesting that with appropriate education it is reasonable to anticipate that vaccination of this population can be readily accomplished.

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