Research Article

Attitudinal Correlates of HPV Vaccination in College Women

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Abstract

This study examined associations between general attitudes toward seeking medical care, attitudes about vaccines/fear of shots, and human papillomavirus (HPV) vaccine uptake and intentions in college women. Hypothesized associations were framed by the Theory of Planned Behavior (TPB). Participants ($N = 330$, mean age = 18.9 years, 75% White) completed a one-time survey. The majority (61%; $n = 201$) had received ≥1 HPV vaccine dose. Hierarchical logistic regression examined relationships between attitudes and vaccine uptake. Pearson correlation coefficients and Kruskal-Wallis tests examined associations between attitudes and vaccine intentions. Results were partially consistent with the TPB. In the final model, perceived benefits, but not fear of shots, were associated with vaccine uptake. Among the unvaccinated, perceived benefits, but not fear of shots, were associated with vaccine intentions. Provider recommendation was the strongest predictor of vaccine uptake. Findings suggest interventions incorporating discussion of perceived benefits and provider recommendation may improve HPV vaccine receipt among college women.

Keywords

health behavior, HPV vaccine, human papillomavirus vaccination, theory of planned behavior, cancer prevention

Introduction

Human papillomavirus (HPV) is a major contributor to oropharyngeal and anogenital (i.e., cervical, vaginal, vulvar, anal, penile) cancers as well as genital warts in the United States (U.S.) (Centers for Disease Control and Prevention, 2014). About 45,000 people are diagnosed with HPV-associated cancers each year in the U.S. of which almost 13,000 are new cases of cervical cancer (Centers for Disease Control and Prevention, 2018, 2019). College students are at particularly high risk for contracting HPV, with 20 to 24 year-old women having the highest prevalence of HPV (63%) compared to other age and gender groups (Lewis et al., 2018). Furthermore, half of the 14 million new HPV infections each year occur among those aged 15 to 24 years (Hamborsky et al., 2015). However, HPV prevalence in these age groups has decreased as HPV vaccination; a 61% decrease in HPV prevalence was seen among 20- to 24-year-olds in the first 8 years after vaccine introduction (Brotherton et al., 2021; Oliver et al., 2017).

The nine-valent HPV vaccine, the vaccine currently available in the U.S., has the potential to prevent up to 92% of HPV-related cancers (Senkomago et al., 2019). The first HPV vaccine was licensed by the Food and Drug Administration (FDA) for use in females ages 9 to 26 in 2006 (U.S. Food and Drug Administration, 2006) and males in 2009 (Centers for Disease Control and Prevention, 2010). The Advisory Committee on Immunization Practices (ACIP) routinely recommends two doses of the HPV vaccine for males and females who initiate vaccination at ages 9 to 14 years or three doses for males and females who get the first dose of vaccine at age 15 years and older (Meites et al., 2016). In 2018, the FDA extended the HPV vaccine licensure to also include all people between ages 27 and 45 years (Meites et al., 2019).

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Despite the potential benefits of the vaccine and the ACIP recommendations, uptake remains low. Among young adults (ages 19–26) in the U.S., 51.5% of women and 21.2% of men reported receiving at least one dose of the HPV vaccine in 2017 (Kasting et al., 2020). Additionally, rates of HPV vaccination vary markedly by state and region, with rural areas having lower uptake (Elam-Evans et al., 2020). A national study found that HPV initiation was 11 percentage points lower for adolescents living in rural areas of the U.S. (Walker et al., 2020). Of relevance to the present study, Indiana is one state with the majority of its 92 counties ($n = 55$, 60%) located in rural or non-metropolitan areas (Affiliated Service Providers of Indiana, Inc, 2011). Nearly half of the 55 rural counties ($n = 26$) in Indiana have shortages of healthcare professionals or are partially or completely medically underserved, resulting in significant health disparities and challenges in HPV vaccine uptake (Affiliated Service Providers of Indiana, Inc, 2011). Indeed, only 29% of 18 to 24 year-olds in Indiana reported HPV vaccine receipt (Indiana State Department of Health, 2014).

Some of the strongest predictors of HPV vaccine outcomes among college students are HPV-related attitudes and beliefs derived from the Theory of Planned Behavior (TPB) (Ajzen, 1991; Bynum et al., 2012). The TPB suggests that increased perceived behavioral control and subjective norms as well as more favorable attitudes toward the behavior predict greater behavioral intentions and engagement in the behavior (Ajzen, 1991). Consistent with the TPB, a study found that perceiving greater parental and doctor support for HPV vaccination was related to more favorable attitudes toward the vaccine which was associated with an increase in HPV vaccine intentions (Stout et al., 2020). Similarly, other studies found that subjective norms and positive attitudes toward HPV vaccination predicted vaccine intentions in college men and women, explaining about 60% of the variance (Catalano, Knowlden, et al., 2017; Catalano, Richards, et al., 2017).

To date, studies on HPV vaccination have assessed attitudes toward the HPV vaccine rather than general attitudes toward healthcare (e.g., pro-action, trust, cynicism) and vaccination, including the fear of shots. From a TPB perspective, these general attitudes should also predict HPV vaccine intentions and receipt. Indeed, in the literature on influenza vaccination, general attitudes toward vaccines and fear of shots were associated with vaccine intentions and uptake in college students (Agarwal, 2014; Landowska et al., 2017; Ryan et al., 2019). If these broader attitudes are also correlated with HPV vaccination, they may be targeted in interventions to improve HPV vaccine uptake.

Based on the TPB, the present study addresses this gap by focusing on general attitudes toward seeking medical care and vaccination as correlates of HPV vaccine intentions and uptake in college women in Indiana, rather than attitudes toward the HPV vaccine specifically, found previous literature (Agarwal, 2014; Landowska et al., 2017; Ryan et al., 2019; Stout et al., 2020). While it is also important to understand correlates of HPV vaccination in men, the current sample did not have sufficient numbers of vaccinated men to draw adequate comparisons; thus, the focus was on women only. We had four study hypotheses: (1) positive attitudes toward seeking medical care will be associated with greater vaccine uptake; (2) positive attitudes about vaccines and lower fear of shots will be associated with greater vaccine uptake; (3) positive attitudes toward seeking medical care will be correlated with greater vaccine intentions among unvaccinated women; and (4) positive attitudes about vaccines and lower fear of shots will be correlated with greater vaccine intentions among unvaccinated women. All hypotheses were tested while controlling for relevant healthcare variables. When testing hypotheses 2 and 4, attitudes toward seeking medical care served as control variables.

Materials and Methods

Participants and Procedures

A total of 434 undergraduates ages 18 to 35 years and fluent in English were recruited through the psychology department participant pool at a public university in Indiana. Given that undergraduate students are in the age range that are at particularly high risk for HPV infection, and are eligible for HPV vaccination, this convenience sample is well-suited for the present study. The sample was mostly female (347/434; 80%), and a low number of male participants had been vaccinated ($n = 15$). Therefore, only data from female respondents were analyzed. Participants over the age of 26 ($n = 17$) were excluded because the vaccine was not approved for these individuals at the time of data collection (U.S. Food and Drug Administration, 2015). Therefore, the final analytic sample consisted of 330 college women.

After providing informed consent, participants completed a 30 to 60 minutes (mean = 35.2 minutes; $SD = 8.9$ minutes) anonymous online cross-sectional survey in a campus computer lab either alone or in groups of up to 15 people. To ensure that privacy was maintained, participants were seated with ample space between them. Data collection occurred between January and December 2015. All procedures were reviewed and approved by the university's institutional review board.

Measures

HPV vaccine uptake and intentions. Participants read a description of HPV vaccination and then indicated if they had heard of the vaccine (Centers for Disease Control and Prevention, 2008). Participants who had heard of the HPV vaccine were asked if they had received the HPV vaccine (Centers for Disease Control and Prevention, 2008). Previous research suggests that self-reported vaccination status correlates moderately well with electronic medical record-confirmed

vaccination status (Rolnick et al., 2013; Thomas et al., 2016). Those who indicated that they had not received the HPV vaccine and those who had not heard of the vaccine were considered unvaccinated.

Among those unvaccinated, one item was used to assess their intentions to obtain the HPV vaccine. Specifically, participants were asked how likely they were to "actually get the HPV vaccine" on a seven-point scale (1 = very unlikely to 7 = very likely) (Gerend & Shepherd, 2012).

Attitudes toward seeking medical care. The Attitudes toward Seeking Medical Care (ASMC) scale includes 35 items rated on four-point scales (Fischer et al., 2013). ASMC includes four subscales: Pro-Action (12 items; "I would want to get medical help right away if I had a health problem that was worrying me"), Nonfatalism/Cynicism (11 items; "When your number is up, it's up; going to the doctor is not going to help anything"), Medical Trust (seven items; "Most medical doctors are well trained to identify and treat all types of serious diseases"), and Non-Avoidant (five items; "I try to avoid medical examinations because I don't want them to find out something bad"). In the present sample, three subscales demonstrated good internal consistency reliability (pro-action $\alpha = .84$; non-fatalism $\alpha = .81$; non-avoidant $\alpha = .86$) and one demonstrated moderate reliability (medical trust $\alpha = .59$).

Attitudes about vaccines/fear of shots. An 11-item measure adapted from previous research was used to assess participants' attitudes about vaccines and fear of shots (AVFS) in general (not the HPV vaccine specifically) on six-point scales (Liau et al., 2012; Short et al., 2010). AVFS includes two subscales: Benefits (eight items; "Vaccines are a good way to protect public health") and Fear of Shots (three items; "Shots are very painful"). The subscales of AVFS demonstrated good internal consistency reliability in the present sample (benefits $\alpha = .91$; fear of shots $\alpha = .88$).

Demographic and health-related variables. Participants completed demographic items, including age, race/ethnicity, gender, income, and relationship status. Additionally, participants reported whether they had health insurance and a regular healthcare provider, the number of visits to a health care provider in the past 12 months, and if a healthcare provider had recommended they receive the HPV vaccine (National Cancer Institute, 2014).

Statistical Analyses

Statistical analyses were conducted using SPSS statistical software (SPSS Inc., version 25, Armonk, NY, 2017). After computing descriptive statistics, demographic, healthcare, and main study variables were examined according to HPV vaccine status (i.e., whether they received one or more HPV vaccine doses) using chi-square or *t*-tests, as appropriate. Given our sample size of 330, with $\alpha = .05$ (two-tailed), we had 80% power to detect an effect size of .32 using an independent samples *t*-test and 80% power to detect an effect size of .15 using a chi-square test. In addition, we had 80% power to detect an odds ratio of 1.48 using logistic regression analysis. In order to obtain a parsimonious model without overfitting the data, variables that differed between groups at $p < .10$ were then entered into a hierarchical logistic regression model (Hosmer et al., 2013). The hierarchical logistic regression was run in the analytic sample to examine the hypothesized relationships between attitudinal variables and HPV vaccine uptake (coded as yes/no). Specifically, healthcare variables (i.e., health insurance status, number of provider visits in the past year, having a regular provider, and whether a provider recommended the HPV vaccine) were entered in step 1; attitudes toward seeking medical care (i.e., pro-action and nonfatal) were entered in step 2; and attitudes about vaccines/fear of shots (i.e., benefits and fear of shots) were entered in step 3.

Next, we examined associations between intentions to receive the HPV vaccine and demographic, healthcare, and main study variables for unvaccinated women using Pearson correlation coefficients for continuous variables and Kruskal-Wallis tests for categorical variables. Variable(s) significantly associated with intentions at $p < .10$ were entered into a linear regression analysis examining the relationship between the variable(s) and intentions.

Results

Sample Characteristics

Table 1 shows descriptive statistics and comparisons of all study variables by vaccine status for our sample of college women. The mean age of the analyzed sample was 18.9 years ($SD = 1.3$), and the majority were non-Hispanic White (75%). Almost half (49%) had seen a provider three or more times in the prior 12 months. Most had a regular healthcare provider (62%) and health insurance (93%). The majority also reported that a healthcare provider had recommended they receive the HPV vaccine (78%), and 201 participants (61%) had received at least one dose of the HPV vaccine, whereas 129 (39%) had not received the HPV vaccine. Nearly one-third (32%, $n = 41$) of unvaccinated participants said they were a little, somewhat, or very likely to receive the HPV vaccine.

Description of HPV Vaccine Uptake

HPV vaccine status was not associated with any demographic characteristics, but was associated with several healthcare variables (see Table 1; $ps < .10$). Specifically, a higher proportion of the vaccinated group reported visiting a provider three or more times in the last 12 months (55.5% vs. 39.5%, $p = .018$), having a regular provider (67.0% vs. 53.1%, $p = .012$), having health insurance (95.0% vs. 89.1%,

Table 1. Descriptive Statistics and Comparisons by HPV Vaccine Status for Undergraduate Women.

	Total ($N = 330$)	Vaccinated women ($n = 201$)	Unvaccinated women ($n = 129$)	p-Value
Demographic characteristics				
Age mean (*SD*)	18.9 (1.3)	18.9 (1.2)	19.0 (1.4)	.439
Race *n* (%)				.303
Non-White	82 (24.8)	46 (22.9)	36 (27.9)	
White	248 (75.2)	155 (77.1)	93 (72.1)	
Income *n* (%)				.151
$0–$49,999	153 (48.3)	85 (44.0)	68 (54.8)	
$50,000–$99,999	92 (29.0)	59 (30.6)	33 (26.6)	
$100,000+	72 (22.7)	49 (25.4)	23 (18.5)	
Marital status *n* (%)				.430
Married	5 (1.5)	2 (1.0)	3 (2.3)	
Living as married	5 (1.5)	4 (2.0)	1 (0.8)	
Single, never married	319 (96.7)	195 (97.0)	124 (96.9)	
Healthcare variables				
Times visiting a provider in the last 12 months *n* (%)				**.018**
None	33 (10.0)	17 (8.5)	16 (12.4)	
1–2 times	134 (40.7)	72 (36.0)	62 (48.1)	
3+ times	162 (49.2)	111 (55.5)	51 (39.5)	
Regular provider *n* (%)				**.012**
Yes	202 (61.6)	134 (67.0)	68 (53.1)	
No	126 (38.4)	66 (33.0)	60 (46.9)	
Health insurance *n* (%)				**.046**
Yes	305 (92.7)	190 (95.0)	115 (89.1)	
No	24 (7.3)	10 (5.0)	14 (10.9)	
Provider recommended the HPV vaccine *n* (%)				**<.001**
Yes	256 (77.6)	194 (96.5)	62 (48.1)	
No	74 (22.4)	7 (3.5)	67 (51.9)	
Intentions to get vaccinated (unvaccinated only) *n* (%)	—	—		n/a
Very unlikely	—	—	48 (37.2)	
Somewhat unlikely	—	—	16 (12.4)	
A little unlikely	—	—	6 (4.7)	
Neither unlikely nor likely	—	—	18 (14.0)	
A little likely	—	—	20 (15.5)	
Somewhat likely	—	—	11 (8.5)	
Very likely	—	—	10 (7.8)	
Attitudes toward seeking medical care				
Pro-action (range: 18–48) mean (*SD*)	38.6 (6.5)	39.1 (6.7)	37.8 (6.1)	.088
Nonfatalism/Cynicism (range: 16–44) mean (*SD*)	33.7 (5.7)	34.3 (5.8)	32.7 (5.3)	**.011**
Medical trust (range: 11–28) mean (*SD*)	21.6 (2.9)	21.6 (2.9)	21.5 (2.9)	.779
Non-avoidant (range: 5–20) mean (*SD*)	15.4 (4.1)	15.5 (4.2)	15.2 (4.0)	.479
Attitudes about vaccines/fear of shots				
Benefits (range: 9–48) mean (*SD*)	36.6 (7.7)	38.5 (6.9)	33.8 (8.1)	**<.001**
Fear of shots (range: 3–18) mean (*SD*)	8.9 (4.8)	8.5 (4.6)	9.5 (5.0)	.085

Note. Bolded values indicate statistical significance at $p < .05$. HPV = human papillomavirus.

$p = .046$), and receiving a provider recommendation for HPV vaccination (96.5% vs. 48.1%, $p < .001$). Furthermore, several psychosocial variables differed by vaccine status. Vaccinated college women in our sample had higher mean scores on the ASMC Nonfatalism/Cynicism subscale (34.3 vs. 32.7, $p = .011$) and the AVFS Benefits subscale (38.5 vs. 33.8, $p < .001$) compared to unvaccinated participants. Although not significant at $p < .05$, Pro-Action ($p = .088$) and Fear of Shots ($p = .085$) were both marginally associated with vaccine uptake.

Relations of Attitudes to HPV Vaccine Uptake

Hierarchical logistic regression analyses were conducted to examine the relations between attitudes toward seeking medical care and vaccines and HPV vaccine uptake (see Table 2).

Table 2. Hierarchical Logistic Regression Analyses of HPV Vaccine Uptake in Relation to Attitudes Toward Medical Care and Vaccines ($N = 330$).

	Block 1	Block 2	Block 3
	OR [95% CI]	OR [95% CI]	OR [95% CI]
Healthcare variables			
Times visiting a provider in the last 12 months			
None	Ref.	Ref.	Ref.
1–2 times	1.27 [0.50–3.20]	1.27 [0.49–3.26]	1.13 [0.43–2.99]
3+ times	1.76 [0.69–4.46]	1.71 [0.65–4.49]	1.37 [0.51–3.72]
Regular provider			
Yes	1.11 [0.61–2.03]	1.08 [0.58–1.99]	1.14 [0.60–2.15]
No	Ref.	Ref.	Ref.
Health insurance			
Yes	1.47 [0.49–4.41]	1.52 [0.50–4.67]	1.35 [0.42–4.34]
No	Ref.	Ref.	Ref.
Provider recommended HPV vaccine			
Yes	**34.70 [13.23–90.99]**	**33.64 [12.79–88.49]**	**35.15 [13.09–94.36]**
No	Ref.	Ref.	Ref.
Attitudes toward seeking medical care			
Pro-action		1.00 [0.95–1.05]	1.00 [0.95–1.05]
Nonfatalism/Cynicism		1.02 [0.96–1.08]	0.98 [0.92–1.04]
Attitudes about vaccines/fear of shots			
Benefits			**1.09 [1.05–1.15]**
Fear of shots			1.01 [0.95–1.08]

Note. Bolded values indicate statistical significance at $p < .05$. HPV = human papillomavirus.

Because none of the demographic variables reached the threshold of $p < .10$, they were excluded from the hierarchical logistic regression analysis. All of the healthcare variables were entered in step 1. Only provider recommendation was statistically significant (OR = 34.70; 95% CI [13.23–90.99]). When attitudes toward seeking medical care (i.e., pro-action and nonfatalism/cynicism) were added in step 2, provider recommendation was the only variable associated with vaccine uptake (OR = 33.64; 95% CI [12.79–88.49]). Thus, results did not support our hypothesis that positive attitudes toward seeking medical care, independent of provider recommendation, would be related to greater HPV vaccine uptake.

Attitudes toward vaccines (i.e., benefits and fear of shots) were added in the third step of the hierarchical logistic regression. When these variables were added, provider recommendation remained a significant correlate of HPV vaccine uptake (OR = 35.15; 95% CI [13.09–94.36]). In addition, perceived benefits of vaccination were also significant (OR = 1.09; 95% CI [1.05–1.15]). However, fear of shots was not related to HPV vaccine uptake. Thus, results partially supported our hypothesis that positive attitudes about vaccines would be related to greater HPV vaccine uptake.

Relations of Attitudes to HPV Vaccine Intentions

In the unvaccinated sample, none of the demographic, healthcare, or attitudes toward medical care variables were significantly associated with HPV vaccine intentions at $p < .10$, and, therefore, were not included in subsequent analyses (see Table 3). The only variable that was correlated with intentions was the AVFS benefits subscale ($r = .23$; $p = .01$). Therefore, it was the only variable included in the linear regression analysis. In this unadjusted linear regression analysis, the benefits subscale was positively associated with intentions ($B = .06$; 95% CI [0.02–0.11]). Thus, results partially support our hypotheses in that attitudes toward vaccines, but not attitudes toward medical care, were associated with HPV vaccine intentions in unvaccinated college women.

Discussion

The current study tests a key aspect of the TPB in the context of HPV vaccination among college women, a population at high risk for HPV (Hamborsky et al., 2015; Hariri et al., 2011). Specifically, we examined whether general attitudes toward seeking medical care and vaccines were associated with HPV vaccination uptake and intentions above and beyond the effects of standard healthcare variables. Attitudes toward seeking medical care were not significantly associated with HPV vaccine uptake when controlling for standard healthcare variables; however, perceived benefits of vaccination were associated with uptake. Similarly, perceived benefits of vaccination, but not attitudes toward medical care, were related to HPV vaccine intentions. Fear of shots

Table 3. Associations Between Study Variables and Intentions to Receive the HPV Vaccine Among Unvaccinated Participants ($n = 129$).

	Kruskal-Wallis *H*	Pearson's *r*	Bivariate *p*-value
Demographic characteristics			
Age		−.003	.97
Race	1.45		.23
Non-White			
White			
Income	.40		.82
$0–$49,999			
$50,000–$99,999			
$100,000+			
Marital status	.46		.50
Married/Living as married ($n = 4$)			
Single, never married ($n = 124$)			
Healthcare variables			
Times visiting a provider in the last 12 months	.13		.94
None			
1–2 times			
3+ times			
Regular provider	2.17		.14
Yes			
No			
Health insurance	1.18		.28
Yes			
No			
Provider recommended the HPV vaccine	.34		.56
Yes			
No			
Attitudes toward seeking medical care			
Pro-action		−.02	.86
Nonfatalism/Cynicism		−.11	.22
Medical trust		−.05	.57
Non-avoidant		.001	.99
Attitudes about vaccines/fear of shots			
Benefits		.23	**.01**
Fear of shots		−.14	.11

Note. Bolded values indicate statistical significance at $p < .05$. HPV = human papillomavirus.

was unrelated to HPV vaccine uptake or intentions. Taken together, results partially support the TPB-based prediction that attitudes would be linked to HPV vaccine outcomes.

Our results converge with limited literature examining relationships between attitudes toward vaccination and HPV vaccine outcomes in young adults (Barnard et al., 2017; Bednarczyk et al., 2015; Britt & Englebert, 2018; Hirth et al., 2018). One study of rural college students found that general attitudes toward vaccination were significantly associated with intentions to receive the HPV vaccine (Britt & Englebert, 2018). Indiana, the location of the current study, also has a large rural population. Research has shown that rural areas have lower HPV vaccine uptake than urban areas (Elam-Evans et al., 2020), which may be due to rural residents' limited information about reproductive health, fostering a mistrust of healthcare and contributing to disparities (Thomas et al., 2013). Other studies of undergraduates at large, public universities have related HPV vaccine-specific attitudes to HPV vaccine outcomes (Barnard et al., 2017; Catalano, Knowlden, et al., 2017). One of these studies found that viewing the HPV vaccine as likely to cause health problems was negatively associated with HPV vaccine uptake (Barnard et al., 2017). Another study of college-aged men found that attitudes (degree of like or dislike) toward HPV vaccination were associated with HPV vaccine intentions (Catalano, Knowlden, et al., 2017). Taken together, our findings with college women along with prior findings with college men and students of all genders point to the importance of educating college students about the benefits of vaccination to improve attitudes, particularly those from low resource areas (Britt & Englebert, 2018; Elam-Evans et al., 2020; Thomas et al., 2013).

Our finding that fear of shots was not associated with HPV vaccine uptake or intentions among college women diverges from findings in prior research with mixed gender samples of college students (Hirth et al., 2018; Ryan et al., 2019). A recent qualitative study of young college students that included equal proportions of men and women found that most had positive attitudes about the HPV vaccine, but noted a fear of needles as a barrier to receiving the vaccine (Hirth et al., 2018). Similarly, a cross-sectional survey of college students that was 80% female found that a common reason for not receiving an influenza vaccine was a fear of needles (Ryan et al., 2019). In contrast, a study of influenza vaccine uptake among college students, of whom 61% were women, found that only 11% reported a fear of needles as a barrier to vaccination, and 10% reported a fear of shots as a barrier (Bednarczyk et al., 2015). Identifying subgroups of college students who may benefit from intervention to reduce their fear of needles is an important direction for future research. For example, a systematic review found that needle fear in young adults was more prevalent among women than among men (McLenon & Rogers, 2019). Thus, an intervention addressing fear of needles may have a stronger effect in women, and future research should examine which populations may benefit from such interventions.

In addition, our study did not find a significant association between general attitudes toward medical care and HPV vaccine uptake or intentions. It should be noted that our sample consisted of primarily White young women with health insurance, a regular provider, and recent contact with the healthcare system. Thus, their healthcare attitudes were, on average, positive. Attitudes toward medical care may have stronger associations with HPV vaccine outcomes in men, minority groups, or those with less contact with the healthcare system, including those who live in rural and low resource areas.

Our results are consistent with previous findings that one of the strongest predictors of HPV vaccine uptake is a provider recommendation (Gilkey et al., 2016; Ylitalo et al., 2013). However, provider recommendation in the current study was not significantly associated with HPV vaccine intentions. Other studies of college students have also found that provider recommendation is more strongly associated with HPV vaccine uptake as compared to intentions (Patel et al., 2012). It should be noted that our unvaccinated college women were less likely to have a regular provider and had fewer visits to a provider in the last year compared to vaccinated participants. Other research has shown that HPV vaccine series completion was associated with having a regular healthcare provider (Winger et al., 2016). Without a regular provider, a relationship of trust has not been established, which may lessen the impact of an HPV vaccine recommendation on intentions. This notion is supported by a recent systematic review that found a positive association between trust in physicians and general vaccine uptake in the majority of studies across populations (Larson et al., 2018).

Application and Future Directions

This research has important implications for future nursing interventions to improve uptake of HPV vaccination among college women. If replicated longitudinally, findings suggest that nursing interventions should emphasize the health benefits of vaccination as opposed to addressing a fear of shots in this population. Research has shown that improving the public's knowledge of the benefits of adult vaccination and vaccine-related attitudes is needed to increase vaccine uptake in the U.S. (Hodin et al., 2013; Nowak et al., 2017). Specifically, nurses can highlight the benefits of vaccination, including reduced risk of HPV-related disease, to improve attitudes. In addition, our results and other research (Gerend & Shepherd, 2012; Gilkey et al., 2016; Ylitalo et al., 2013) point to the importance of provider recommendation in increasing college women's HPV vaccine uptake. Research shows that an effective recommendation is timely, strong, urgent, consistent, and uses presumptive language (Brewer et al., 2017; Gilkey et al., 2016), yet many providers are not providing this type of HPV vaccine recommendation (Sturm et al., 2017). Nurses might consider implementing Quality Improvement initiatives that feature incorporation of strong, timely, and consistent presumptive recommendations that highlight HPV vaccine benefits among college-aged patients.

Limitations

Limitations of the current study warrant mention. First, our sample consisted of women at a university in Indiana, a state with low HPV vaccine uptake (Indiana State Department of Health, 2014), and the majority were White. Thus, our results may not be generalizable to men, people of other races/ethnicities, or people in other geographic locations. Second, these data are cross-sectional, precluding the examination of the temporality of these relationships. Third, although self-reported HPV vaccination status generally corresponds with true vaccination status (Rolnick et al., 2013; Thomas et al., 2016), it is subject to recall bias and social desirability bias. Finally, specific questions about nursing care would have allowed us to differentiate the impact of nursing recommendations and visits from those of other healthcare providers.

Conclusions

Perceived benefits of HPV vaccination, but not fear of shots, were associated with both HPV vaccination intentions and uptake. Provider recommendation was the strongest predictor of HPV vaccination uptake. Based on this research, nurses can hold conversations with college students about the benefits of HPV vaccination and give a strong recommendation for the HPV vaccine. These conversations could have a significant impact, ultimately decreasing HPV-related morbidity and mortality.

Availability of Data and Material

Data are available on reasonable request from the authors.

Declaration of Conflicting Interests

The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: Dr. Zimet has received honoraria for consulting work with Sanofi Pasteur and Merck and travel funds from Merck to attend an HPV vaccine symposium. The other authors declare that there is no conflict of interest.

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Research Ethics and Patient Consent

All procedures were reviewed and approved by the university's institutional review board. Written informed consent was waived to protect participants' anonymity. The consent form was reviewed with all participants, but written consent was waived.

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