



Examining the Influence of Religious and Spiritual Beliefs on HPV Vaccine Uptake Among College Women

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Abstract

The human papillomavirus (HPV) vaccine is an effective mechanism to prevent HPV-associated cancers; however, uptake is low among women aged 18–26. Religiosity/spirituality is associated with sexual health decision-making. This study examined the role of religious/spiritual beliefs on HPV vaccination among college women ($N=307$) using logistic regression and mediation analyses. Findings indicate that sexual activity is the main factor associated with HPV vaccination; and sexual activity fully mediates the relationship between religious/spiritual beliefs and HPV vaccination. Health promotion efforts should highlight the importance of HPV vaccination regardless of current sexual activity and may benefit from partnerships with religious/spiritual organizations.

Keywords Human papillomavirus (HPV) · HPV vaccination · Religion · Spirituality · Sexual health · College students

Introduction

The human papillomavirus (HPV) is the most common sexually transmitted infection in the United States (US) (Burchell et al. 2006). Most HPV infections are asymptomatic and clear on their own [Centers for Disease Control and Prevention (CDC) 2017]. However, HPV consists of multiple strains including high- and low-risk types (CDC 2017); low-risk types can cause genital warts, while high-risk types can cause various cancers (i.e., anal, cervical, vaginal, vulvar, oropharyngeal). The

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HPV vaccine is an approved and effective primary prevention mechanism that can protect against multiple types of HPV, preventing genital warts and HPV-associated cancers. Three vaccines are currently available: Cervarix, Gardasil, and Gardasil-9. Adolescent girls and boys aged 11 and 12 are the primary target for HPV vaccination; however, uptake of the HPV vaccine is suboptimal for this target group. Additionally, only 65.1% of girls and 56.0% of boys aged 13–17 had received at least one dose of the HPV vaccine as of 2016 (Walker et al. 2017). As a result, “catch-up” vaccination is recommended for males through age 21 (with the exception of men who have sex with men and immunocompromised men, who can be vaccinated up to age 26), and for females through age 26 (CDC 2017). Thus, promotion efforts among young adults are important to the overall goal of increasing HPV vaccination rates.

Young adulthood (aged 18–26) and corresponding college enrollment can be an important period of sexual exploration and autonomous decision-making (Harris et al. 2017). Moreover, young adult women aged 20–29 have the highest prevalence of HPV compared to other age-groups (Markowitz et al. 2016). Yet, uptake of the HPV vaccine is surprisingly low among young adult women—in 2015, only 41.6% of women aged 19–26 had received at least one dose of the HPV vaccine (Williams 2017). Therefore, young college women are a key group that should be considered in efforts to increase HPV vaccine uptake.

The period of young adulthood coincides with more frequent healthcare utilization, particularly among women (Martinez et al. 2013). For example, the American College of Obstetricians and Gynecologists recommends that women begin receiving contraceptive counseling starting at age 18, regardless of their current pregnancy intentions (Nicholson 2016). Additionally, the US Preventive Services Task Force recommends that women begin screening for cervical cancer with Pap testing every 3 years starting at age 21; and at age 30, women can delay Pap testing to every 5 years when combined with HPV testing (Moyer 2012). Since HPV testing is not recommended until age 30, annual women’s health visits could serve as critical touchpoints for the promotion of the HPV vaccine among young women aged 21–26 (Thompson et al. 2017).

Given the opportunity for young college women to make autonomous decisions about HPV vaccination, individual-level factors such as culture, attitudes, and beliefs related to the vaccine are important considerations. A key cultural phenomenon that has been explored in relation to HPV vaccine uptake is religion and/or spirituality. Religion can be defined as “society-based beliefs and practices relating to God or a higher power commonly associated with a church or organized group” (Egbert et al. 2004, p. 8). Spirituality has been described as “a basic or inherent quality in all humans that involves a belief in something greater than self and a faith that positively affirms life” (Miller 1995, p. 257). According to the *2014 US Religious Landscape Study* conducted by the Pew Research Center (2015a, b), young millennials (those born between 1990 and 1996) vary in religious affiliation. Although 36% of young millennials are unaffiliated with a religious group, 56% identify with the Christian faith, while 8% identify with a non-Christian group such as Buddhist or Hindu (Pew Research Center 2015b). Among young millennials, 38% reported that religion is significantly important to their lives (Pew Research Center 2015a).

Research has shown that religiosity (i.e., the extent to which one is religious) is an influential factor in sexual behavior. Among young adults, religiosity indicators like self-reported religious importance and church attendance are shown to influence the age at first sexual encounter, number of sexual partners, and frequency of unprotected sex (Burris et al. 2009; George Dalmida et al. 2018; Luquis et al. 2012; Wigfall et al. 2012). For example, adolescent females between the ages of 15 and 20 who reported regular church attendance and high religious importance were less likely to initiate sex at a younger age and have fewer sexual partners when compared to those who reported infrequent church attendance and low religious importance (George Dalmida et al. 2018). Similarly, Burris et al. (2009) noted that religiosity was associated with fewer sexual partners among study participants, aged 17–29 years. Within the college setting in particular, previous research has found positive associations between religiosity and safer sexual attitudes and behaviors, such as less sexual permissiveness, later sexual debut, and greater condom usage (Luquis et al. 2012; Wigfall et al. 2012).

Studies have found a more negative association between religiosity and HPV vaccine uptake. For example, Bernat and colleagues found that young women who attended religious services in the past 30 days were less likely to have initiated the HPV vaccine compared to young women who had not attended religious services (Bernat et al. 2013). More recently, Bodson and colleagues reported similar findings among young women in Utah (Bodson et al. 2017). Specifically, young women who reported practicing organized religion were less likely to have received any dose of the HPV vaccine compared to those who reported not practicing an organized religion (Bodson et al. 2017). In short, there is evidence to support positive associations between religiosity and/or spirituality and various safe sex practices (e.g., later sexual debut, condom use, etc.) among young adults, particularly within the college environment. However, the literature also supports a negative association between religiosity and HPV vaccine acceptance among young women. Given these somewhat equivocal findings, additional research is necessary to better understand how religiosity and/or spirituality may influence HPV vaccine decisions among young women within the college environment. Therefore, the purpose of this study was to examine the extent to which young college women's beliefs about the role of religion/spirituality on sexual decision-making were associated with HPV vaccine uptake.

Methods

Overall Approach

Data for this study were collected as part of a larger study on sexual health among college students, which was approved by the Institutional Review Board at the University of South Florida (USF). The parent study included men and women, aged 18–49, who were enrolled at USF and who completed an online survey between November 2016 and April 2017. Participants were recruited using an online listserv, course announcements, and in person at campus events and meetings. Participants

affirmed consent to participate by reading an overview of the study and consent documents and then continuing with the online survey. The first 500 participants received a \$10 gift card for participation, and all participants were eligible for a tablet raffle. A total of 616 participants completed the survey for the parent study; and among those, 570 were aged 18–26 years, 451 self-identified as women (i.e., selected “Woman” when asked how they described their gender), and 430 were not missing data for any key study variables. Young men are only eligible for the HPV vaccine up to age 21, with the exception of men who have sex with men and immunocompromised men, who can be vaccinated up to age 26 (CDC 2017). The parent dataset did not contain the information necessary to determine HPV vaccine eligibility for men; therefore, men were excluded from the present study. The present study sample was limited to women, aged 18–26, who answered a particular set of items related to HPV vaccination ($N=307$).

Measures

This study assessed the extent to which religious and/or spiritual beliefs influenced HPV vaccination among young college women. The main independent variable (IV), *religious/spiritual beliefs*, was measured using a single item which asked, “To what extent do your religious and/or spiritual beliefs influence your sexual decision-making?” Response options ranged from “Not at All” to “Very Much” on a 5-point Likert scale. This item was adapted from a previous study which assessed the relationship between religion and sexual behavior among college students (Brimeyer and Smith 2012). Given that meanings of religion and spirituality vary across individuals and groups, the research team selected an item that allowed participants to: (1) define religion and spirituality in whatever way they chose; and (2) respond to the item in a way that was most relevant to them, given their religious and/or spiritual self-identification. The intent of this item was to capture participants’ perceptions about the influence of their faith beliefs (however, they define them) on their sexual behavior. The primary dependent variable (DV), *HPV vaccination*, was measured using the following item: “[Explanation of the HPV vaccine] Have you EVER received the HPV vaccine?” Response options included “Yes,” “No,” and “Don’t know.” The “No” and “Don’t know” categories were combined and labeled as “No.”

A number of socio-demographic characteristics were also assessed, including race, ethnicity, age, sexual orientation, relationship status, religious affiliation, and sexual activity. Race was measured by asking participants to describe themselves using the following response options: White or Caucasian; Black or African American; Asian; Native Hawaiian or Pacific Islander; American Indian or Alaska Native; Other (please specify). Race was recoded into four categories (“White/Caucasian,” “Black/African American,” “Asian,” and “Other”). Ethnicity was coded as “Hispanic” or “Not Hispanic.” Participants were asked to fill in their age, which was assessed as a continuous variable. Participants were asked to describe their sexual orientation from the following response options: Straight/Heterosexual; Gay; Lesbian; Bisexual; Something else (please specify); Unsure. Sexual orientation was recoded as “Heterosexual” and “Not Heterosexual,” where women who reported any sexual orientation other than

heterosexual (e.g., lesbian, bisexual, etc.) were categorized as “Not Heterosexual.” Participants were asked to describe their relationship status from the following response options: Single, not dating; Single and dating; In a relationship (not living together); In a relationship (living together); Married/Civil Union; Separated/Divorced; Widowed/Widower. Relationship status was recoded into two categories (“Committed Relationship/Married” and “Not in a Relationship”). Religious affiliation was assessed using the following response options: Non-religious; Christian (e.g., Catholic, Baptist, Methodist); Jewish; Muslim; Hindu; Buddhist; Other (please specify). Religious affiliation was recoded into three categories (“Christian,” “Other Religion,” and “Non-Religious”). Finally, participants were asked the type of sexual activity they participated in within the last 12 months using the following response options: Vaginal sex; Oral sex; Anal sex; Not sexually active in the last 12 months. Sexual activity was dichotomized into “Sexually Active” and “Not Sexually Active.”

Data Analyses

Study data were analyzed using SAS version 9.4. Descriptive statistics including frequencies, means, and standard deviations were calculated to describe the sample. Chi-square tests (for categorical variables) and *t* tests (for continuous variables) were conducted to assess differences in all study variables by HPV vaccination status. The PROC REG statement was used to test for multicollinearity among IVs, and no multicollinearity issues were detected. Unadjusted logistic regression analyses were run to test the association between HPV vaccination and all IVs separately, estimating crude odds ratios and 95% confidence intervals using the PROC LOGISTIC statement. Next, adjusted odds ratios and 95% confidence intervals were estimated to test the association between religious/spiritual beliefs and HPV vaccination, adjusting for all socio-demographic variables.

Additionally, mediation analyses were conducted to test whether the relationship between religious/spiritual beliefs (main IV) and HPV vaccination (main DV) was mediated by relationship status or sexual activity (potential mediators). Mediation was tested using Baron and Kenny’s (1986) method, which includes the following four steps: (1) test the direct association between the main IV and DV; (2) test the direct association between the main IV and potential mediator; (3) test the association between the potential mediator and main DV, while controlling for the main IV; and (4) test the effect of the main IV on the main DV when the potential mediator is included in the model (Baron and Kenny 1986). If the influence of religious/spiritual beliefs on HPV vaccination is significantly diminished after including relationship status or sexual activity to the model, then mediation is demonstrated.

Results

Sample Description

Descriptive characteristics of the sample are reported in Table 1. Participants had a mean age of approximately 21 years ($SD=1.99$), 61% identified as White and 21% identified as Hispanic. Most participants reported being sexually active in the last 12 months (85.3%), and over half of the participants indicated that they were in a committed relationship (56.4%). Over half of the sample identified as Christian (55%), about 10% reported a different religious affiliation such as Muslim or Hindu, and over 34% said they were non-religious. In this sample, the item measuring the extent to which one's religious/spiritual beliefs influenced their sexual decision-making had a mean score of 2.07 (range = 1–5, with higher scores indicating that sexual decisions were more influenced by religious/spiritual

Table 1 Descriptive characteristics of the study population by HPV vaccination status

Variable	Total sample <i>N</i> =307	HPV vaccine <i>N</i> =230	Unvaccinated <i>N</i> =77	<i>p</i> value
	<i>N</i> (%) or <i>M</i> ± <i>SD</i>	<i>N</i> (%) or <i>M</i> ± <i>SD</i>	<i>N</i> (%) or <i>M</i> ± <i>SD</i>	
Religious/spiritual beliefs	2.07±1.32	1.92±1.20	2.5±1.57	< 0.01
Age	20.6±1.99	20.66±2.01	20.44±1.92	0.41
Ethnicity				0.72
Hispanic	64 (21)	49 (16.01)	15 (4.90)	
Non-Hispanic	242 (79)	180 (58.82)	62 (20.26)	
Race				0.08
White/Caucasian	188 (61)	150 (49.02)	38 (12.42)	
Black/African American	50 (16)	32 (10.46)	18 (5.88)	
Asian	34 (11)	24 (7.84)	10 (3.27)	
Other	34 (11)	23 (7.52)	11 (3.59)	
Relationship status				0.01
Committed relationship/married	134 (43.6)	110 (35.83)	24 (7.82)	
Not in a committed relationship	173 (56.4)	120 (39.09)	53 (17.26)	
Sexual orientation				0.70
Heterosexual	254 (83)	189 (61.76)	65 (21.24)	
Not heterosexual	52 (17)	40 (13.07)	12 (3.92)	
Sexual activity				< 0.01
Sexually active	262 (85.3)	207 (67.43)	55 (17.92)	
Not sexually active	45 (14.7)	23 (7.49)	22 (7.17)	
Religious affiliation				0.35
Christian	169 (55)	126 (41.04)	43 (14.01)	
Other religion	32 (10.4)	21 (6.84)	11 (3.58)	
Non-religious	106 (34.5)	83 (27.04)	23 (7.49)	

Bold values indicate statistical significance at the $p < 0.05$ level

beliefs). Finally, about 75% of participants had received at least one dose of the HPV vaccine.

Unadjusted Logistic Regression

Crude odds ratios were estimated to assess the independent effect of each predictor variable on HPV vaccination (Table 2). Relationship status was significantly associated with HPV vaccination (OR = 0.49, 95% CI 0.29–0.85), with those who were not in a committed relationship being less likely to have received the HPV vaccine compared to those who were in a committed relationship. Additionally, sexual activity was significantly associated with HPV vaccination (OR = 0.28, 95% CI 0.14–0.54), with those who were not sexually active being less likely to have received the vaccine compared to those who were sexually active. Finally, religious/spiritual beliefs were significantly associated with HPV vaccination (OR = 0.73, 95% CI 0.61–0.89), with those having higher mean scores on the religious/spiritual beliefs item being less likely to have received the HPV vaccine compared to those with lower religious/spiritual belief scores.

Table 2 Factors associated with HPV vaccination among young college women

Variable	Crude OR (95% CI)*	Adjusted OR (95% CI)*
Religious/spiritual beliefs	0.73 (0.61–0.89)	0.85 (0.68–1.05)
Age	1.06 (0.93–1.21)	1.05 (0.91–1.22)
Ethnicity		
Hispanic	1.13 (0.59–2.15)	1.06 (0.53–2.13)
Non-Hispanic	Referent	Referent
Race		
White/Caucasian	Referent	Referent
Black/African American	0.45 (0.30–0.89)	0.66 (0.31–1.39)
Asian	0.61 (0.27–1.38)	0.66 (0.27–1.63)
Other	0.53 (0.24–1.18)	0.78 (0.32–1.90)
Relationship status		
Committed relationship/married	Referent	Referent
Not in a committed relationship	0.49 (0.29–0.85)	0.64 (0.35–1.17)
Sexual orientation		
Heterosexual	Referent	Referent
Not heterosexual	1.15 (0.57–2.32)	0.97 (0.46–2.06)
Sexual activity		
Sexually active	Referent	Referent
Not sexually active	0.28 (0.14–0.54)	0.44 (0.21–0.93)

Bold values indicate statistical significance at the $p < 0.05$ level

*OR odds ratio, CI confidence interval

Adjusted Logistic Regression

Adjusted odds ratios were estimated to test the association between religious/spiritual beliefs and HPV vaccination, adjusting for all socio-demographic variables described previously (Table 2). Only sexual activity remained significant in the adjusted model (aOR = 0.44, 95% CI 0.21–0.93), indicating that those who were sexually active were more than twice as likely to have received the HPV vaccine compared to women who were not sexually active.

Mediation Analyses

Since relationship status and sexual activity both had direct bivariate associations with HPV vaccination (Table 2), further analyses were conducted to determine if either variable mediated the relationship between religious/spiritual beliefs and HPV vaccination. In step two of mediation analyses, religious/spiritual beliefs were not directly associated with relationship status; therefore, no further mediation analyses were conducted with the relationship status variable. Analyses continued to determine if sexual activity mediated the relationship between religious/spiritual beliefs and HPV vaccination.

In step one of mediation analyses, religious/spiritual beliefs were directly associated with HPV vaccination (OR = 0.79, 95% CI 0.64–0.97). In step two, religious/spiritual beliefs were directly associated with sexual activity (OR = 1.79, 95% CI 1.37–2.35). In step three, sexual activity was associated with HPV vaccination, while controlling for religious/spiritual beliefs (OR = 0.44, 95% CI 0.21–0.93). In step four, while controlling for sexual activity, the association between religious/spiritual beliefs and HPV vaccination was no longer significant (OR = 0.85, 95% CI 0.68–1.05), indicating that sexual activity fully mediates the relationship between religious/spiritual beliefs and HPV vaccination in this sample (Fig. 1).

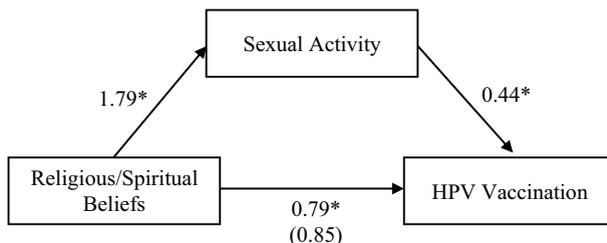


Fig. 1 Mediation model testing sexual activity as a mediator in the association of religious/spiritual beliefs and HPV vaccination among young college women. Note that asterisk indicates $p < 0.05$

Discussion

This study explored the relationship between religious/spiritual beliefs and HPV vaccination among young college women. At the bivariate level, relationship status, sexual activity, and religious/spiritual beliefs were each independently associated with HPV vaccination among this sample of college women. However, after adjusting for socio-demographic variables, only sexual activity remained significantly associated with receiving the vaccine. In particular, young women who reported being sexually active in the last 12 months were more than two times as likely to have initiated the HPV vaccine compared to those who reported no sexual activity in the last 12 months. Further analyses revealed that the relationship between religious/spiritual beliefs and HPV vaccination was fully mediated by sexual activity.

Previous research has indicated that religious/spiritual beliefs are closely tied to beliefs about sex and sexual decision-making among young women (Burris et al. 2009; George Dalmida et al. 2018; Luquis et al. 2012; Wigfall et al. 2012). Accordingly, individuals with strong religious/spiritual beliefs may be more likely to practice monogamy and/or abstain from sex (Lefkowitz et al. 2004). This could help explain why sexual activity mediates the relationship between religious/spiritual beliefs and HPV vaccination. Moreover, young women who are not sexually active may have lower HPV risk perception compared to women who are sexually active, and therefore choose not to receive the HPV vaccine (Ferrer et al. 2014; Rambout et al. 2014).

Although not explored in this study, parental beliefs and upbringing could also help explain the relationship between religious/spiritual beliefs and HPV vaccination. For example, young women who grew up in devout religious households may hold religious/spiritual beliefs reflective of their upbringing and parental views. Thus, higher mean scores on the religious/spiritual beliefs item could serve as a proxy for parental beliefs. Accordingly, previous research has shown that parents with stronger religious beliefs are more likely to oppose the HPV vaccine compared to parents with less strong religious beliefs (Barnack et al. 2010; Constantine and Jerman 2007; Shelton et al. 2013). For example, one study comprised of a national sample of parents with daughters aged 9–17 found that parents who reported frequent church attendance were more likely to have decided not to vaccinate their daughters against HPV compared to parents who did not attend church (Shelton et al. 2013). Therefore, parental religious beliefs may help explain the bivariate association between young women's religious/spiritual beliefs and HPV vaccination.

Limitations

A major premise of this study is that young women entering college are able to override parental decisions not to receive the HPV vaccine. Therefore, stratifying the sample to allow for comparisons between those who got vaccinated as adults and those who had not been vaccinated would have been ideal. However, the sample was not large enough to make these comparisons. Additionally, we are limited by the cross-sectional nature of the data in that we could not assess the temporality of

religious/spiritual beliefs, and how changes in beliefs may influence HPV vaccine decisions. Another limitation was the inability to include men in analyses. Since HPV vaccination guidelines for young men are more narrow (e.g., up to age 21 unless high risk), there was not enough information available to determine vaccine eligibility for young men in the sample. Moreover, students who chose to participate in this study may not be representative of all students from this particular university, or US college students more broadly. Lastly, there are many ways to measure religious/spiritual beliefs, including church attendance, other religious involvement, prayer, etc. The main measure of religious/spiritual beliefs in this study was a single, self-report item assessing the extent to which a young woman felt that her religious and/or spiritual beliefs influenced her sexual decision-making.

Implications for Future Research

This study raises a number of questions for future research. Being sexually active was the main factor associated with receiving the HPV vaccine among this sample of young women; thus, there is a need for interventions targeting non-sexually active young women that highlight the value of receiving the vaccine prior to becoming sexually active. There is also a need for qualitative research to gain more in-depth understanding of *how* religious and spiritual beliefs may factor into the decision-making process for HPV vaccination. Previous research suggests that spirituality and/or religion may be helpful in crafting cancer prevention messages that target women, particularly African Americans who tend to report higher levels of religiosity and/or spirituality compared to other groups (Best et al. 2015, 2016). Therefore, future research should explore the role of religion and/or spirituality on HPV vaccination decisions, specifically among African American college women. Lastly, future research should explore how HPV vaccination compares to other sexual decisions with regards to the influence of religion/spirituality.

Conclusions

Young college women are a critical target population for HPV vaccine promotion due to the high prevalence of HPV among this group, low vaccination rates, increased healthcare utilization, and their ability to make autonomous healthcare decisions. Findings from this research indicate that the odds of receiving the HPV vaccine are greater among young women who are sexually active compared to those who are not. Although not significant in multivariate analyses, religious/spiritual beliefs and relationship status showed significant bivariate associations with HPV vaccination, suggesting that these variables may also underlie decisions about HPV vaccination among young women (e.g., sexual activity may be influenced by relationship status and/or religious/spiritual beliefs). Accordingly, health promotion efforts targeting young college women should include messages highlighting the importance of HPV vaccination regardless of current sexual activity; and these efforts may benefit from partnerships with religious/spiritual organizations

on college campuses to enhance the delivery of HPV vaccination and other health messages.

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Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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