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Development of a survey to examine the association between relationship status and human papillomavirus vaccination behavior

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Running Head: *Association between relationship status and HPV vaccination behavior*

Development of a Survey to Examine the Association between Relationship Status and Human
Papillomavirus Vaccination Behavior

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Abstract

Literature: HPV is the most prevalent STI in the United States. Although a vaccine to prevent HPV infection exists, only 49.5% of females were up-to-date on the recommended vaccination HPV vaccination series in 2016. Though recommended for younger individuals, there is a catch-up period for females ages 18-26, which shows consistent under-participation. One potential risk factor for non-vaccination may be relationship status. Unlike other sexual health issues where monogamous, long-term relationships serve as a protective factor, such relationships may negatively impact HPV infection risk perception. Building from previous qualitative research, this study examined the quantitative association between relationship status and HPV vaccination behavior.

Methodology: This exploratory cross-sectional study included an electronic survey among females 18-26 years old (N=629) who attend a large public university in the mid-Atlantic region. Bivariate and descriptive statistics were estimated using SPSS 24 to explore likelihood of vaccination during the catch-up age-range by relationship status.

Results: Of participants, most were Caucasian (82.5%), undergraduate students (92.8%), who had received the HPV vaccine (79.0%), of which 7.9% received the vaccine during the catch-up period. Being Single and Dating was associated with vaccination during the catch-up period compared to all other relationship groups ($X^2(1) = 4.87$, $p < 0.05$; OR = 0.49, 95% CI 0.25 – 0.93).

Discussion: Single and Dating status was found to be a protective factor for participating in catch-up vaccination, potentially due to increased risk perception. Limitations include unique characteristics of the student population which limited variability in married/monogamous relationship status. Future research should continue to examine relationship status as a barrier to participation in catch-up vaccination.

Key words: Human papillomavirus, college women, vaccination, relationship status

Background

Human Papillomavirus (HPV) is the most prevalent sexually transmitted infection in the United States and nearly all sexually active individuals will contract it at some point in their lives (Centers for Disease Control and Prevention [CDC], 2017). This has serious implications, as HPV is associated with several types of cancer, including: cervical, anal, vaginal, vulvar, penile, and oropharyngeal cancer (CDC, 2017). Although there is an effective vaccine to prevent HPV infection, only 49.5% of U.S. females were up-to-date on the recommended HPV vaccination series in 2016 (Walker et al., 2017). This is of particular importance because young adult females have the highest prevalence of contracting HPV, as over half of college-aged females will contract HPV within four years after her first sexual intercourse (Saslow et al., 2007). The vaccine is targeted toward individuals who are 11-12 years old, though the recommended catch-up vaccination period for females is ages 18-26 (Markowitz et al., 2014). The catch-up period of HPV vaccination refers to the opportunity for previously unvaccinated young females to receive the vaccine before the age of 26 and still receive its benefits. It is important for young women to engage in this behavior if they have not previously been vaccinated.

Despite an increasing trend in HPV vaccination in adolescents in recent years, there remains a consistent lack of participation among this catch-up age group (Schmidt & Parsons, 2014). There are several important barriers to receiving vaccination among this group, including: cost-considerations, feeling the vaccine is unnecessary, safety concerns, healthcare provider recommendation, and social norms (Rambout, Tashkandi, Hopkins, & Tricco, 2014). A systematic review found that among twenty two studies conducted on barriers to vaccination for females in Canada and the United States, cost of the vaccine was the most common self-reported barrier (Rambout et al., 2014). Second to this factor was women feeling that the vaccine was not

needed, as many women viewed their risk for contracting HPV as low (Rambout et al., 2014). This review also frequently identified that concerns about the safety and potential side effects of the vaccine are a significant barrier to uptake, as well as a low level of knowledge and awareness about HPV (Rambout et al., 2014). Insufficient provider communication and current sexual inactivity were also associated with non-vaccination (Rambout et al., 2014).

The risk factor for non-vaccination behavior that this study was focused on was relationship status. Long-Term, Monogamous relationships are a barrier to females ages 18-26 receiving the vaccine (Thompson, Vamos, Straub, Sappenfield, & Daley, 2017). This type of relationship status is typically perceived as a protective factor against sexually transmitted infections, however with HPV this is not the case (Burchell, Winer, de Sanjose, & Franco, 2006). Women with just one lifetime sexual partner still have an 84% risk of acquiring an HPV infection, and so monogamy, which is usually equated with safe sex, cannot be considered a protective factor in this case (Chesson, Dunne, Hariri, & Markowitz, 2014). Previous research that has examined this concept has been qualitative in nature, therefore this study developed a measure to quantitatively examine the association between these relationship status and HPV vaccination behavior.

The purpose of this study was to develop and pilot test a quantitative measure based on previous qualitative research done by Dr. Thompson on relationship status as a risk factor for non-vaccination in women 18-26 years old. Her research used in-depth interviews conducted among college-aged women to collect data and requires further quantitative research to validate the findings (Thompson et al., 2017). Women in long-term relationships or who have had few sexual partners have a lower perceived risk and perceived severity of contracting HPV and are therefore less likely to participate in the catch-up phase of HPV vaccination (Thompson et al.,

2017). Women who are dating or have multiple sexual partners have a higher perceived risk and perceived severity of contracting HPV and are therefore more likely to participate in the catch-up phase of the HPV vaccine (Thompson et al., 2017). This trend exists even though relationship status has little effect on whether or not a sexually active female will develop an HPV infection at some point in her life.

The quantitative nature of this present study acted as a supplement to the qualitative research done by Dr. Thompson. This study may provide a framework for further quantitative studies on this subject by providing a structure for future studies and by determining the feasibility, reliability, and validity of the survey instrument that was developed. Two similar studies have been conducted at a New York university and a southern Californian university, which were used to study the factors that influence a collegiate woman's decision to engage in HPV vaccination. In 2010, undergraduate females at a large public university in New York State participated in a study that surveyed HPV vaccination beliefs among this age group, and how they impact a young woman's decision to participate in the catch-up phase of the vaccine (Bednarczyk, Birkhead, Morse, Doleyres, & McNutt, 2011). At a large public university in southern California, a similar study was conducted among female undergraduates. That study used an electronic survey to examine the factors that influenced individuals in this target population's decision to receive the HPV vaccine (Ratanasiripong, Cheng, & Enriquez, 2013).

Whereas both of these previous studies found that relationship status was among the myriad of contributing influences over women receiving the HPV vaccination in the catch-up period, neither focused on this factor in particular. Therefore, this study provides an important addition to the literature, because it not only contributes to this growing wealth of information surrounding HPV vaccination behaviors in young adult females, but it is also unique in that it

was conducted in the mid-Atlantic region and focused on relationship status as an influencing factor over a college woman's decision to receive the HPV vaccine. This survey also served an important purpose as it is the first measure that collects data on HPV beliefs among female JMU students. Currently, there are no available data on the beliefs that JMU students harbor about HPV or the vaccine, much less how relationship status may affect the vaccination behaviors of James Madison University's female students. The research questions that were examined in this study were:

1. Does relationship status affect likelihood of being vaccinated during the catch-period of vaccination among JMU females?
2. Does relationship status predict intention to vaccinate among JMU females who are not previously vaccinated?

Methodology

Procedures

The method of this study was the development of a quantitative survey instrument distributed among females 18-26 years old who attend a large public university in the mid-Atlantic region. Before beginning the study, IRB approval was obtained and the cover letter can be found in Appendix A. This study occurred in two parts, survey development and cognitive interviewing. Cognitive interviewing involved eight participants. In order to recruit participants for cognitive interviews, cash incentives (\$5) were offered to eligible participants. Eligible participants were full-time, female JMU students between the ages of 18-26 who knew their vaccination status. Recruitment was done by emails sent to students enrolled in a class with the researcher after obtaining professor permission. Potential participants were then directed to a Qualtrics survey to determine their eligibility for participation in cognitive interviews.

Participants were eligible for cognitive interviewing if they were full-time female students at JMU between the ages of 18-26 and fit into a stratification group. Stratification groups are subsets of the population based on factors of interest, which in this case were vaccination status and relationship status. Participants who met these criteria were contacted and an in-person interview was scheduled to occur on JMU's campus. During the interview, the participant completed the initial survey via Qualtrics on either a laptop or smartphone, and was asked to think out loud as they answered each item. In particular, the researcher asked the participant to identify any areas of confusion they have regarding question wording and format. Based on the findings of cognitive interviews, modifications were then made to the survey.

Once the cognitive interviews were completed, the final version of the survey was distributed to 13,000 female JMU students via a bulk email with a link to an electronic Qualtrics survey. In order to recruit participants for completion of the finalized online survey, entry into a lottery for a cash incentive (\$10) was offered. After completion of the survey, participants followed a separate link to another Qualtrics survey to input their name and email address for the incentive lottery so that names and email addresses were not connected to survey data. A random number generator was used to select five participants to receive the incentive. Once the survey was closed, the researcher in association with her project advisors completed data cleaning, descriptive statistics, and chi-square analyses on the data.

Measures

Independent variables measured in this study included relationship status, HPV knowledge, attitude toward relationships, HPV risk perception, and attitude toward the HPV vaccine. To understand the relationship status of individuals, they were asked to select their current relationship status as: Married or living with a partner, Not married, but in a long-term,

monogamous relationship (You are committed to one person), Single and dating (You are seeing people but not committed to one person), or Single and not dating (You are not seeing anyone). These relationship statuses were adapted from Dr. Thompson's work and then modified after cognitive interviewing. This was a necessary step because participants in cognitive interview generally did not understand what category they belonged in, and felt that they needed further clarification on the specifications of each status. The HPV Knowledge Scale used in this study was in true/false/unsure format and was adopted from a scale previously used in HPV research (Thompson, Vamos, Griner, & Daley, 2016). Three different five-point Likert Scales were developed and used to examine attitudes toward relationship, risk perception, and attitude toward HPV vaccination. The answer choices ranged from "Strongly Disagree" to "Strongly Agree." The scale on attitudes toward relationship helped the researcher further determine what each status meant to an individual, and the level of commitment they have to a partner. This was necessary because it further clarifies whether or not relationship status affects participation in catch-up vaccination. The scale on risk perception was necessary because it helped determine the HPV risk perception each relationship status held. The scale on attitudes toward vaccination helped the researcher determine if the different relationship statuses affected attitude toward vaccination.

The dependent variables measured in this study were HPV vaccination status and intention to vaccinate among previously unvaccinated individuals. In order to understand the vaccination status of participants, the researcher asked whether the participants had received the vaccine, at what age they received their first dose, and how many doses they had received. For those participants who were unvaccinated, the researcher asked whether or not they intended to receive the vaccine, and if so when they anticipated receiving their first dose. The researcher also

collected participant demographics including sex, age, year in college, race/ethnicity, sexuality, and health insurance status. The survey can be found in Appendix B.

Participants

Participants in this study were full-time female students between the ages of 18-26 at JMU (enrolled in 12 credits or more if an undergraduate student or 9 credit hours or more if a graduate student in the Fall 2017 semester) who knew their HPV vaccination status. In order to conduct the preliminary cognitive interviews, participants were identified via class lists in the researcher's classes with professor permission. There were a total of eight cognitive interview participants, with four of the eight proposed stratification groups represented. A breakdown of the represented stratification groups in the cognitive interviews is shown in Table 1. Participants in the final survey were identified through a bulk email request, which was delivered to 13,000 female JMU students. Before participation in the survey, participants had to read the cover letter that can be found in Appendix A and provide consent. After consenting, 736 were eligible to participate based on their gender, age, full-time student status, and knowledge of their HPV vaccination status. Six hundred and twenty nine of these participants completed the final survey, creating a completion rate of 85.46%.

Analysis

The survey was sent to 13,000 female JMU students, of whom 822 began the survey, and 629 eligible participants completed it. Only the responses from participants who were eligible and who fully completed the survey were used for analysis (N=629). Bivariate and descriptive statistics were completed using SPSS 24 to explore differences in likelihood of vaccination during the catch-up age-range and intention to vaccinate by relationship status. This included chi-square tests and odds ratios with 95% confidence intervals to estimate associations for each

category of relationship (Single and not Dating, Single and Dating, Long-Term, Monogamous Relationship, or Married or Living with a Partner) to 1 - Participation in HPV Catch-Up Vaccination and 2 - Intention to Participate in HPV Catch-Up Vaccination. In order to complete the chi-squares, the researcher recoded HPV vaccination status and age of first dose into a new variable, participation in HPV catch-up vaccination. This variable separated participants into two distinct groups: individuals who were vaccinated and who had received their first dose after age 18, and other participants. The second variable that the researcher recoded for use in the chi-squares was intention to participate in HPV catch-up vaccination. This variable was created using HPV vaccination status and intention to vaccinate, and again separated participants into two distinct groups: unvaccinated individuals who intended to receive the HPV vaccine, and unvaccinated individuals who either did not intend or were unsure of their intent to receive the vaccine. Relationship statuses were also recoded in order to conduct chi-squares. Four new variables were created that distinguished one relationship group from all of the others: "Married or living with a Partner v. Others", "Long-Term, Monogamous relationship v. Others", "Single and Dating v. Others", and "Single and not Dating v. Others." Due to the shortage of participants who were married or living with a partner, a new variable was created that merged this status with long-term, monogamous relationship status in order to observe if any new effect was found. Again, this variable was recoded to distinguish it from other statuses as "Married or Monogamous v. Others."

Results

Demographics

Of the 13,000 female students who received the survey, 822 began it generating a response rate of 6%. There were 629 eligible and complete responses that were used for analysis.

All were female full-time students at JMU who were between the ages of 18-26 and knew their HPV vaccination status. Most participants were Caucasian (82.5%) and non-Hispanic/Latino (94.4%), with a minority (6.7%) of participants who reported being more than one race. Most were undergraduate students (92.8%), with 28.3% freshman, 16.5% sophomores, 25.3% juniors, and 22.7% seniors. Heterosexuality was the most common reported sexuality (88.4%) and bisexuality was the second most reported (7.5%). Most participants were privately insured (94.0%) and had had sexual intercourse (75.2%). A breakdown of participant demographics can be found in Table 2.

The most common relationship status recorded in this study was Long-Term, Monogamous Relationship (n = 264) and the least common was Married or Living with a Partner (n = 14). A breakdown of the relationship groups can be seen in Table 3. Of currently sexually active participants, the largest single group reported that they always used a condom or protective barrier method with their current partner(s) (24.8%) and occasionally engaged in sexual activity under the influence of alcohol or drugs (44.2%). A small percentage (5.9%) of participants had been diagnosed with an STD/STI at some point, and a majority of those with a history of STI/STD had informed their partner(s) of this condition (75.6%).

Most participants had received the HPV vaccine (79.0%), of which 7.9% received the vaccine during the catch-up period from ages 18-26. Of those who had not yet received the vaccine, 15.2% intended to receive it. The most commonly cited influencing factor for receiving/not receiving the vaccine was parents/guardians (82.2%). A majority of participants were aware of the recommended ages for HPV vaccination (77.9%) and were aware of the availability of a catch-up period of vaccination (79.3%). A majority of participants had never received a Pap-smear before (64.1%) and of the ones who had, most had never received an

abnormal Pap-smear (81.9%). Only two participants had ever been diagnosed with genital warts (0.3%). Most participants indicated that they had no family history of HPV-associated cancers (71.2%), but of those participants with a history, the most commonly cited was cervical cancer (22.7%).

Knowledge Scale

HPV-related knowledge of participants was low. Significant findings included that most participants were unsure about or incorrectly reported that HPV can cause HIV/AIDS ($n = 387$, 61.5%). Most participants were also unsure about or reported that HPV can cause herpes ($n = 409$, 65%). A majority of participants did not know that HPV can cause anal ($n = 466$, 74.1%), oral ($n = 464$, 73.8%), and penile cancer ($n = 432$, 68.7%). There was also a lack of knowledge that there is no routine screening for oral cancer ($n = 504$, 80.1%) or routine HPV screening for men ($n = 487$, 77.4%). Most did not realize the HPV cannot be cured ($n = 348$, 55.3%), and lastly, a majority of participants either were unsure or answered that “Most sexually active people will get HPV” was false ($n = 522$, 83.0%). A full breakdown of the knowledge scale results can be found in Table 4.

Research Question 1 - Does relationship status affect likelihood of being vaccinated during the catch-period of vaccination among JMU females?

Single and Dating women were more likely to be vaccinated during the catch-up period compared to all other relationship statuses ($X^2(1) = 4.87$, $p < 0.05$; OR = 0.49, 95% CI 0.25 – 0.93). Single and not Dating status was not significantly associated with vaccination during the catch-up period compared to all other relationship statuses ($X^2(1) = 0.71$, $p < 0.05$; OR = 1.12, 95% CI 0.61 - 2.06). Long-Term, Monogamous Relationship status was not significantly associated with vaccination during the catch-up period compared to all other relationship statuses

($X^2(1) = 0.27$, $p < 0.05$; OR = 1.41, 95% CI 0.76 - 2.61). Married or Living with a Partner status was not significantly associated with vaccination during the catch-up period compared to all other relationship statuses ($X^2(1) = 0.31$, $p < 0.05$; OR = 1.11, 95% CI 1.08 - 1.15). Married or Living with a Partner status combined with Long-Term, Monogamous Relationship status was not significantly associated with vaccination during the catch-up period compared to all other relationship statuses ($X^2(1) = 0.17$, $p < 0.05$; OR = 1.53, 95% CI 0.83 - 2.83).

Research Question 2 - Does relationship status predict intention to vaccinate among JMU females who are not previously vaccinated?

Single and Dating women were more likely to intend to vaccinate if previously unvaccinated compared to all other relationship statuses ($X^2(1) = 4.87$, $p < 0.05$; OR = 0.49, 95% CI 0.25 - 0.93). Single and not Dating status was not significantly associated with intention to vaccinate among unvaccinated individuals compared to all other relationship statuses ($X^2(1) = 0.77$, $p < 0.05$; OR = 0.87, 95% CI 0.33 - 2.29). Long-Term, Monogamous Relationship status was not significantly associated with intention to vaccinate among unvaccinated individuals compared to all other relationship statuses ($X^2(1) = 0.98$, $p < 0.05$; OR = 0.99, 95% CI 0.38 - 2.57). Married or Living with a Partner status was not significantly associated with intention to vaccinate among unvaccinated individuals compared to all other relationship statuses ($X^2(1) = 0.34$, $p < 0.05$; OR = 1.19, 95% CI 1.10 - 1.28). Married or Living with a Partner status combined with Long-Term, Monogamous Relationship status was not significantly associated with intention to vaccinate among unvaccinated individuals compared to all other relationship statuses ($X^2(1) = 0.74$, $p < 0.05$; OR = 1.18, 95% CI 0.45 - 3.07).

A cross tabulation showed that women who were “Single and Dating” had a higher risk perception of contracting HPV. When asked to respond to “I am at risk for contracting HPV”,

27.93% of Single and Dating women somewhat agreed or strongly agreed. This is compared to the proportion of Single and not Dating women (12.92%), Long-term, Monogamous women (9.09%), and Married women (7.14%) who somewhat or strongly agreed with this statement.

Discussion

This study found that Single and Dating status was the only relationship status that was significantly associated with participation in HPV catch-up vaccination and intention to vaccinate among those who had not yet received the HPV vaccine. This may be because those who are in this group have an increased risk perception of contracting HPV. This finding is important because no previous literature indicates that such a relationship status could be perceived as a protective factor for vaccination. This association may indicate that women in this group have a more accurate risk perception of their risk for HPV infection and therefore may be likely to participate in catch-up vaccination. This could be because women in this group may understand more about sexual behaviors and the associated risks than women who are not dating or are monogamous. HPV risk perception is counterintuitive to other STIs/STDs as being in a monogamous relationship is not a protective factor against infection. The counterintuitive risk perception of HPV is due to its nature of transmission, as penetrative sex is not the only means of transmission; HPV can be spread through mucosal transmission. The implication of this finding is that raising the risk perception across the other relationship groups may serve as an effective means of increasing catch-up participation. The cross-tabulation that was conducted indicates that this finding (Single and Dating status was a protective factor for HPV vaccination) may be based on their risk perception for HPV infection.

This study also found that monogamy was not a risk factor for non-participation in HPV catch-up vaccination. This finding was surprising as previous qualitative literature has found this

relationship status to be an important barrier to receiving the HPV vaccine for young adult females (Thompson et al., 2017). One reason for this discrepancy could be that JMU does not have a large enough population of women who are married or living with a partner, so any association between this group and non-participation in HPV catch-up vaccination may have been hidden. Further, many of the women who were in a monogamous relationship or married in this study were vaccinated at a young age, and so did not have the opportunity to participate in catch-up vaccination. Of the nine married women who were vaccinated, six were vaccinated before age 17 (66.67%). Anecdotaly, JMU is a traditional campus and the students are young, which means they are more likley to live in single-gender housing. The high proportion of females at JMU also indicates that there may be less of an opportunity for heterosexual relationships. Of the 205 monogamous women who were vaccinated, 159 were vaccinated before age 17 (77.56%). This means that there was a smaller proportion of women who were married or monogamous and still unvaccinated, affecting the association between this relationship status and intention to vaccinate as well.

The recorded vaccination rate was higher than anticipated. This may be because the JMU student body tends to be of higher socioeconomic background and therefore may have less of a stigma against the vaccine and better access to vaccination. The median family income of JMU students is about \$147,000 and nearly 70% of the student body comes from the top 20% (Chetty, Friedman, Saez, Turner, & Yagan, 2017). These numbers are both considered high among Virginian schools and selective public schools within the United States (Chetty et al., 2017). Previous studies have found that family income level and having health insurance, especially private health insurance, is associated HPV vaccination state-by-state (Pruitt & Schootman, 2010). Females from families in states with higher levels of poverty within the United States

were less likely to receive the vaccine (Pruitt & Schootman, 2010). There is also a small number of students at JMU who are first-generation college students, which may have contributed to the high vaccination rate. JMU began collecting information on its first-generation college students in 2016, and it was reported in 2018 that 540 sophomores and 632 freshmen enrolled at JMU who were classified as such (Lewis, 2018). A previously conducted study found that females whose parents had completed college/some college were more likely to have received the HPV vaccine compared to those females whose parents obtained a high school education or less (Brewer et al., 2011).

In addition, JMU female students' knowledge about HPV was varied. There was a significant deficit concerning knowledge of what constituted an HPV-related condition, who is at risk for infection, and measures of screening. Most participants correctly identified that HPV infection is associated with cervical cancer, but failed to realize that it is also associated with anal, penile, and oral cancers. This indicates that there is a need for increased knowledge across JMU's campus about HPV and its implications. There were, however, some areas that the majority of participants were knowledgeable about, including the fact that both men and women can be infected with HPV and it can be spread without a person's knowledge.

Strengths and Limitations

The strengths of this survey include its sample size, the use of cognitive interviews, the use of previously validated instruments where possible, and the study design based on formative research. This survey was distributed to 13,000 individuals of which 629 completed it, leaving a large sample size used for analysis. The use of cognitive interviews while developing this survey created a finalized instrument that was less prone to wording and formatting errors, and therefore more accurate in its collection of data. Previously validated instruments were adapted for use in

this survey where possible, including the HPV knowledge scale that was developed by Dr. Daley and adapted by Dr. Thompson (Thompson et al., 2016). The study design grew from this previous qualitative research, which increased its strength. With a basis in this formative research, the developed survey instrument was more directed in the data collected and justified in the survey items.

The limitations of this study included the unique characteristics of the student population which limited variability in married/monogamous relationship status. Because JMU is a traditional university with mainly undergraduate students, very few are married or living with a partner. As of Fall 2017, 20,779 students were undergraduates and 1,888 were graduate students (James Madison University, 2018). This limited number may have led to an inaccurate representation of the association between this relationship status and participation in the catch-up period of vaccination. Further, JMU is geographically isolated in the Shenandoah Valley region which also contributes to a limited number of older/non-traditional students within the population.

JMU demographics vary significantly from other universities in the nation and therefore may not be generalizable. Most of the students are white, female, and come from high-income families. About 74% of all JMU students were white in 2017, compared to the national average in 2015 of 57.6% of white students at all universities (James Madison University, 2017; National Center for Education Statistics [NCES], 2015). The student body at JMU is composed of 40% males and 60% females as of Fall 2017, which is similar to the national average of 56.37% female students and 43.62% male students (James Madison University, 2018; NCES, 2015). As previously mentioned, the median household income of JMU students' family's is \$147,000

(Chetty et al., 2017). This is higher than the national average household income of university students, which is \$72,710 (The College Board, 2016).

Another limitation of this study was that not all stratification groups were represented in the original cognitive interviews. No participants were “Married or Living with a Partner”, which shows a critical underrepresentation of this group throughout the entire study. No unvaccinated individuals from the “Single, Not Dating” and “Single and Dating” statuses were represented during cognitive interviews, either. The final survey, therefore, may have included potential wording and formatting issues that disproportionately affected unvaccinated individuals.

A final limitation of this study was the response rate of 6%. The survey was electronically distributed to 13,000 participants, 822 of whom began the survey. Of these 822, 736 were eligible for participation. In total, 629 eligible participants fully completed the survey. A low response rate can be expected due to the nature of this study, as response rates of online surveys tend to be reduced compared to paper-based surveys (Nulty, 2008). The completion rate of this survey was 85.46%. Participants were most likely to drop out after selecting which cancers family members had had and before completing the relationship and/or risk scales. The group who did not complete the survey was not significantly different from the group who did, except for comparison on two factors. The incomplete group was less likely to have received the HPV vaccine (46.3%) and more likely to have been diagnosed with an STD/STI (41.5%). Reasons for non-completion may include the length of the survey, lack of interest in the topic, and the personal nature of the questions.

Suggestions for Future Research

Future research should continue to examine relationship status as a barrier to participation in catch-up vaccination. Researchers should focus on verifying that Single and Dating

relationship status is a potential protective factor for receiving HPV vaccine. They should continue to examine whether or not monogamous relationships and being married are a risk factor for non-participation in this catch-up period. To do so, studies should be conducted at non-traditional universities where married women are more represented within the student body. Additionally, future studies should be conducted at universities with more socioeconomic and racial diversity. As future research continues to examine the association between these factors, the growing wealth of knowledge should be used to create programs designed to decrease barriers for participation in HPV catch-up vaccination and increase risk perception across all relationship statuses.

Conclusion

This study examined the association between relationship status and HPV vaccination among JMU female students. The collection of these data may be useful to the university in future health campaigns surrounding HPV and vaccination on campus. Such efforts should work to promote HPV awareness, including awareness of how the infection is contracted, who is at risk, and what the consequences may be. JMU could also use these data to promote the opportunity for its students to participate in catch-up vaccination and why it is important that they do so. This study was unique in its region and specificity, and could help the JMU community by providing foundational information concerning the need for HPV educational campaigns and increasing the participation in the HPV vaccination catch-up schedule. Future research should continue to build on this topic by verifying the association found here and further examining the role of monogamous relationships as a barrier to participation in the HPV catch-up period of vaccination. More studies need to be done at non-traditional universities where the population of married women and those living with a partner is greater. As the wealth

of knowledge around HPV vaccination behavior continues to grow, health professionals at various universities will gain a new set of data that will help them determine how to effectively promote participation in HPV catch-up vaccination. This has the potential to prevent HPV-associated cancers and improve the health of college women across the United States.

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Tables

Table 1. Cognitive Interview Stratification Groups (n = 8)

	Vaccinated	Unvaccinated
Single, not dating	2	0
Dating, but not monogamous	2	0
Monogamous relationship	2	2
Married or living with partner	0	0

Table 2. Demographics of Analytic Sample (n = 629)

Variable	Responses	Frequency	Percentage
Year in School		n	%
	Freshman	178	28.3
	Sophomore	104	16.5
	Junior	159	25.3
	Senior	143	22.7
	Graduate student	45	7.2
Sexuality		n	%
	Heterosexual/straight	556	88.4
	Bisexual	47	7.5
	Lesbian	10	1.6
	Prefer not to answer	2	.3
	Other	14	2.2
Race		n	%
	White	519	82.5

	Black/African American	26	4.1
	Asian	22	3.5
	Other/multiracial	62	9.9
Insurance		n	%
	Private	591	94.0
	Public	19	3.0
	None	16	2.5
	Unsure	3	.5
Have had sexual intercourse		n	%
	Yes	473	75.2
	No	156	24.8

Table 3. Relationship Status (n = 629)

Relationship Status	Frequency	Percent
Not married, but in a long-term, monogamous relationship (You are committed to one person)	264	42.0
Single and not dating (You are not seeing anyone)	240	38.2
Single and dating (You are seeing people but not committed to one person)	111	17.6
Married or living with a partner	14	2.2

Table 4. HPV Knowledge Scale Results (n = 629)

HPV Knowledge Scale Item	CORRECT	INCORRECT*
HPV can cause HIV/AIDS	242 (38.5%)	387 (61.5%)
HPV can cause abnormal Pap smears in women	390 (62%)	239 (38%)
HPV can cause herpes	220 (35%)	409 (65%)
HPV can affect a woman's ability to get pregnant	571 (90.8%)	58 (9.2%)
HPV can cause genital warts	329 (52.3%)	300 (47.7%)
HPV can be passed to a newborn at birth	567 (90.1%)	62 (9.9%)
HPV can cause cervical cancer	458 (72.8%)	171 (27.2%)
HPV can cause anal cancer	163 (25.9%)	466 (74.1%)
HPV can cause oral cancer	165 (26.2%)	464 (73.8%)
HPV can cause penile cancer	197 (31.3%)	432 (68.7%)
There are many types of HPV	463 (73.6%)	166 (26.4%)
Only men can get HPV	566 (90.0%)	63 (10.0%)
You can have HPV without knowing it	548 (87.1%)	81 (12.9%)
HPV is a virus	470 (74.7%)	159 (25.3%)
Only women can get HPV	508 (80.8%)	121 (19.2%)
HPV is a bacterial infection	335 (53.3%)	294 (46.7%)
Some types of HPV cause cancer, and some do not	368 (58.5%)	261 (41.5%)
HPV is a sexually transmitted infection	467 (74.2%)	162 (25.8%)
Antibiotics can cure HPV	357 (56.8%)	272 (43.2%)
Using a condom decreases the chance of HPV transmission	517 (82.2%)	112 (17.8%)
There is a vaccine for women that prevents certain types of HPV	534 (84.9%)	95 (15.1%)
You can always tell when someone else has HPV	550 (87.4%)	79 (12.6%)

HPV is spread on toilet seats	391 (62.2%)	238 (37.8%)
Even if you do not see a wart, you can transmit HPV	467 (74.2%)	162 (25.8%)
There is routine screening for oral cancer	125 (19.9%)	504 (80.1%)
There is a vaccine for men that prevents certain types of HPV	293 (46.6%)	336 (53.4%)
There is routine HPV screening for men	142 (22.6%)	487 (77.4%)
Transmission of HPV can occur through sexual contact with another person	526 (83.6%)	103 (16.4%)
HPV can be cured	281 (44.7%)	348 (55.3%)
Once you have HPV, you can never get rid of it	276 (43.9%)	353 (56.1%)
Most sexually active people will get HPV	107 (17.0%)	522 (83.0%)

*Incorrect: wrong answer OR unsure of answer

Appendix A

Cover Letter

Identification of Investigators & Purpose of Study

You are being asked to participate in a research study conducted by Ansley Waters from James Madison University. The purpose of this study is to examine the association between HPV vaccination behavior and relationship status. This study will contribute to the researcher's completion of her honors thesis.

Research Procedures

This study consists of an online survey that will be administered to individual participants through Qualtrics. You will be asked to provide answers to a series of questions related to HPV vaccination behavior and relationship status.

Time Required

Participation in this study will require 10 minutes of your time.

Risks

The investigator does not perceive more than minimal risks from your involvement in this study (that is, no risks beyond the risks associated with everyday life).

Benefits

Potential benefits from participation in this study include: contributing to the increasing wealth of information about HPV and HPV vaccination behavior, providing evidence for future health campaigns, and gaining awareness about HPV and the HPV vaccine.

Confidentiality

The results of this research will be presented at the JMU Honors Symposium. While individual responses are anonymously obtained and recorded online through the Qualtrics software, data is kept in the strictest confidence. No identifiable information will be collected from the participant and no identifiable responses will be presented in the final form of this study. All data will be stored in a secure location only accessible to the researcher. The researcher retains the right to use and publish non-identifiable data. At the end of the study, all records will be destroyed. Final aggregate results will be made available to participants upon request.

Participation & Withdrawal

Your participation is entirely voluntary. You are free to choose not to participate. Should you choose to participate, you can withdraw at any time without consequences of any kind. However, once your responses have been submitted and anonymously recorded you will not be able to withdraw from the study.

Questions about the Study

If you have questions or concerns during the time of your participation in this study, or after its completion or you would like to receive a copy of the final aggregate results of this study, please contact:

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Health Sciences
James Madison University
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Questions about Your Rights as a Research Subject

Dr. David Cockley

Chair, Institutional Review Board

James Madison University

(540) 568-2834 cocklede@jmu.edu

Giving of Consent

I have been given the opportunity to ask questions about this study. I have read this consent and I understand what is being requested of me as a participant in this study. I certify that I am at least 18 years of age. By clicking on the link below, and completing and submitting this anonymous survey, I am consenting to participate in this research.

Appendix B

Survey

(Cover letter & provide consent)

Do you attend JMU full-time (Undergraduate student: registered for 12 credit hours or more this semester/Graduate student: registered for 9 credit hours or more this semester)?

- Yes
- No

What is your age?

What is your sex?

- Male
- Female
- Other
- Prefer not to answer

What is your year in school?

- Freshman
- Sophomore
- Junior
- Senior
- Graduate student

Are you Hispanic/Latino?

- Yes
- No

What is your race? (Choose all that apply)

- American Indian/Alaska Native
- Asian
- Black/African American
- White
- Other
- Prefer not to answer

Do you consider yourself to be:

- Heterosexual or straight
- Lesbian
- Bisexual
- Something else (please specify): _____
- Prefer not to answer

Do you currently have health insurance?

- I am covered under a private health insurance plan (on your parent's insurance, through your job, OR you pay for yourself).
- I am covered under a public health insurance plan (Medicare or Medicaid).
- I do not have health insurance
- Unsure
- Prefer not to answer

Have you visited the JMU Health Center?

- Never
- Visited in the past month
- Visited in the past 6 months
- Visited in the past year
- Visited over a year ago
- Unsure

When was the last time you visited a primary care physician?

- Never
- Visited in the past month
- Visited in the past 6 months
- Visited in the past year
- Visited over a year ago
- Unsure

Did you receive the flu vaccine within the past calendar year?

- Yes
- No

Unsure

What is your current relationship status?

Married or living with a partner

Not married, but in a long-term, monogamous relationship (You are committed to one person)

Single and dating (You are seeing people but not committed to one person)

Single and not dating (You are not seeing anyone)

When was the last time you started a new relationship? (Any relationship, casual or committed)

Not applicable

Within the last 3 months

Between 4-6 months ago

Between 7-12 months ago

Over a year ago

Unsure

When was the last time you ended a relationship? (Any relationship, casual or committed)

Not applicable

Within the last 3 months

Between 4-6 months ago

Between 7-12 months ago

Over a year ago

Over five years ago

Unsure

When do you anticipate starting a new relationship? (Any relationship, casual or committed)

Not anticipated in the foreseeable future

Anticipated within the next month

Anticipated within the next 6 months

Anticipated within the next year

Unsure

Display This Question: If What is your current relationship status? != Single and not dating (You are not seeing anyone)

When do you anticipate ending a relationship? (Any relationship, casual or committed)

- Not anticipated in the foreseeable future
- Anticipated within the next month
- Anticipated within the next 6 months
- Anticipated within the next year
- Unsure

Have you ever had sexual intercourse?

- Yes
- No

Have you ever had vaginal-penile intercourse?

- Yes
- No

Have you ever had oral intercourse?

- Yes
- No

Have you ever had anal intercourse?

- Yes
- No

Display This Question: If Have you ever had sexual intercourse? = Yes

How many new sexual partners have you had within the past year?

Display This Question: If Have you ever had sexual intercourse? = Yes

Within the past year, how often did your current sexual partner(s) use a condom or protective barrier method?

- No current partners within the past year
- Never
- Occasionally
- Frequently
- Always

Within the past year, how often did you engage in sexual behavior while under the influence of alcohol or drugs?

- No sexual behavior in the past year
- Never
- Occasionally
- Frequently
- Always

Display This Question: If What is your current relationship status? != Single and not dating (You are not seeing anyone)

Has your current partner(s) ever been diagnosed with an STI/STD?

- Yes
- No
- Unsure

Have you ever been diagnosed with an STI/STD?

- Yes
- No
- Unsure

Display This Question: If Have you ever been diagnosed with an STI/STD? = Yes

Did you inform your current partner(s) of your diagnosis?

- Yes
- No

Have you received the HPV vaccine (also known as Gardasil or Cervarix)?

- Yes
- No
- Unsure

Display This Question: If Have you received the HPV vaccine (also known as Gardasil or Cervarix)? = Yes

Who decided that you would receive the HPV vaccine?

- I did
- A parent/guardian did
- Joint decision

- Unsure

Display This Question: If Have you received the HPV vaccine (also known as Gardasil or Cervarix)? = Yes

How many doses of the HPV vaccine have you had?

- One
- Two
- Three
- Unsure

Display This Question: If Have you received the HPV vaccine (also known as Gardasil or Cervarix)? = Yes

At what age did you receive your first dose of the HPV vaccine?

- 11-12 years old
- 13-17 years old
- 18-26 years old
- Unsure

Display This Question: If Have you received the HPV vaccine (also known as Gardasil or Cervarix)? = No

Do you intend to receive the HPV vaccine?

- Yes
- No
- Unsure

Display This Question: If Do you intend to receive the HPV vaccine? = Yes

When do you plan to receive your first dose of the HPV vaccine?

- Within the next month
- Within the next 6 months
- Within the next year
- More than a year from now
- Unsure

Who influenced your decision to receive (not receive) the HPV vaccine? (check all that apply)

- Parents/Guardians
- Other Family Member
- Doctor
- Nurse
- Partner
- Friend
- School
- Other (please specify): _____
- None of these

Which of the following influenced your decision to receive (not receive) the HPV vaccine? (check all that apply)

- Availability of vaccine
- Cost of vaccine
- Knowledge of vaccine
- Relationship status
- Safety of vaccine
- Other (please specify): _____
- None of these

To the best of your ability, please mark the following statements as true, false, or unsure.

	True	False	Unsure
HPV can cause HIV/AIDS	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HPV can cause abnormal Pap smears in women	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HPV can cause herpes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

HPV can affect a woman's ability to get pregnant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HPV can cause genital warts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HPV can be passed to a newborn at birth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HPV can cause cervical cancer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HPV can cause anal cancer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HPV can cause oral cancer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HPV can cause penile cancer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There are many types of HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Only men can get HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You can have HPV without knowing it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HPV is a virus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Only women can get HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

HPV is a bacterial infection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Some types of HPV cause cancer, and some do not	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HPV is a sexually transmitted infection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Antibiotics can cure HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using a condom decreases the chance of HPV transmission	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There is a vaccine for women that prevents certain types of HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You can always tell when someone else has HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HPV is spread on toilet seats	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Even if you do not see a wart, you can transmit HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There is routine screening for oral cancer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

There is a vaccine for men that prevents certain types of HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There is routine HPV screening for men	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Transmission of HPV can occur through sexual contact with another person	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HPV can be cured	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Once you have HPV, you can never get rid of it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Most sexually active people will get HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Are you aware that the HPV vaccine is recommended for females ages 11-12?

- Yes
- No

Are you aware that women who did not receive the HPV vaccine when they were younger could receive it when they are 13-26 years old?

- Yes
- No

When was the last time you had a Pap Smear?

- Never
- Within the past year
- 1-2 years ago
- Over 2 years ago

- Unsure

Display This Question: If When was the last time you had a Pap Smear? != Never
Have you ever had an abnormal Pap Smear?

- Yes
- No
- Unsure

Have you ever been diagnosed with genital warts?

- Yes
- No
- Unsure

Has an immediate family member ever been diagnosed with any of the following cancers (check all that apply):

- Cervical
- Vaginal
- Uterine
- Ovarian
- Penile
- Rectal
- Oropharyngeal
- None of these
- Unsure

Display This Question: If What is your current relationship status? != Single and not dating (You are not seeing anyone)

Please indicate the extent to which you agree or disagree with the following statements. Answer with either your current partner or most recent partner in mind, or think of a hypothetical relationship.

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
<hr/>					

I am invested in my current relationship(s)	<input type="radio"/>				
My partner(s) and I have similar values	<input type="radio"/>				
I am comfortable discussing issues related to sexual and reproductive health with my partner(s)	<input type="radio"/>				
I talk to my partner(s) about their previous relationship history(s)	<input type="radio"/>				
I talk to my partner(s) about my previous relationship history(s)	<input type="radio"/>				
My partner(s)'s opinions influence my major decisions	<input type="radio"/>				

I always use protection against STIs/STDs (i.e. a condom, protective barrier) during sexual intercourse with my current partner(s)	<input type="radio"/>				
I always use protection (i.e. a condom, dental dam) during sexual intercourse with any new partner(s)	<input type="radio"/>				

Please indicate the extent to which you agree or disagree with the following statements.

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
I am at risk for contracting an STD	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am at risk for contracting HIV/AIDS	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am at risk for contracting HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Being diagnosed with an STD is serious	<input type="radio"/>				
Being diagnosed with HIV/AIDS is serious	<input type="radio"/>				
Being diagnosed with HPV is serious	<input type="radio"/>				
I am more likely than other women my age to be diagnosed with HPV	<input type="radio"/>				

Please indicate the extent to which you agree or disagree with the following statements. The catch-up period of vaccination refers to how previously unvaccinated women can receive the HPV vaccine between the ages of 13-26.

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
It is safe to participate in the catch-up period of HPV vaccination	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

The HPV vaccine is effective during the catch-up period of vaccination

○ ○ ○ ○ ○

If not previously vaccinated, it is necessary to participate in the catch-up period of HPV vaccination

○ ○ ○ ○ ○

If I had not been previously vaccinated, I would participate in the catch-up period of vaccination

○ ○ ○ ○ ○

It is important for others to receive the HPV vaccine

○ ○ ○ ○ ○

I would recommend to my partner(s) to participate in the catch-up period of HPV vaccination

