

Factors Influencing HPV Vaccination Uptake Among College Students

by

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## **ABSTRACT**

The human papillomavirus (HPV) is the most commonly contracted sexually transmitted disease in the United States and is the cause for most cases of HPV-related cancers. Although there is an HPV vaccine, it is not yet widely administered as it is not part of the required vaccinations. This study examined health beliefs, such as perceived barriers and perceived susceptibility, for obtaining the HPV vaccine among college students, in addition to determining the success of a health education event for increasing knowledge and awareness about HPV and the HPV vaccine. The pre- and posttests given to participants at an on-campus educational event were analyzed using paired sample t-tests and one-way ANCOVA analyses. The findings of this study show that in this sample, the most common barriers to receiving the HPV vaccine are lack of parental support, lack of access to the vaccine, low perceived susceptibility and low perceived severity. However, results determined that the educational event was successful in significantly increasing knowledge and awareness and positively influencing health beliefs about HPV and the HPV vaccine.

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## **CHAPTER I**

### **INTRODUCTION**

The human papillomavirus (HPV) is the most commonly contracted sexually transmitted infection in the United States (Centers for Disease Control and Prevention, 2019a). With over 150 different strands, the virus is so prevalent that nearly all sexually active men and women (roughly four out of every five) will be infected with HPV at some point in his or her lifetime.

Though the majority of HPV strands are generally harmless, there are several strands that can ultimately result in serious health problems. The most serious health condition that HPV is linked to is cancer, including cancers of the vulva, vagina, cervix, penis, anus, or in the back of the throat (CDC, 2019a). While not everyone who contracts HPV develops cancer, HPV is attributable for nearly all the cases (91%) for both cervix and anal cancers (CDC, 2018).

Due to the public health risk HPV presents, there are vaccines available to prevent HPV-related cancers. The Food and Drug Administration (FDA) has approved all three vaccines, with the Gardasil 9 vaccine manufactured by Merck the currently recommended HPV vaccine for both males and females (National Cancer Institute, 2018). The Centers for Disease Control and Prevention recommend the Gardasil 9 vaccine for children around the ages of 11 and 12 years old. Though the recommendation for the vaccine starts at younger ages, the Gardasil 9 is still recommended for both males and females up to the age of 26 (CDC, 2019a).

Due to the fact that college students are still able to receive the HPV vaccine and that this population is at higher risk for contracting STIs, it is important to target this population for health promotion and education programs to increase vaccination uptake. While overall there are roughly 14 million new cases of HPV that are diagnosed each year in the United States, it is estimated that nearly 74% of these new cases are diagnosed in the age range of 15 to 24-year olds (Rohde et al., 2018). Therefore, the college-age population, meaning 18 to 24-year-olds that comprises the majority of the population of new cases, is at high risk for contracting HPV. According to Thompson et al.'s report (2016) using the National College Health Assessment-II, HPV vaccination rates for females were nearly 69% for females and almost 43% in males. The reason for this difference could be explained by the fact that men are less aware that the HPV vaccine exists (Sandfort & Pleasant, 2009; Fontenot et al., 2014).

Ultimately, the college-aged population is of utmost importance to target vaccination programs. Based off of the literature, reasons for not obtaining the vaccine include a disconnect between actual and perceived risks of HPV and barriers to obtaining the vaccine exist in males (Fontenot et al., 2014) as well as a lack of positive subjective norms for females (Ratanasiripong, 2014). The literature also reflects a difference in the percentage of males and females opting to receive the HPV vaccine, which provides reason to particularly target males and attempt to understand why they are not receiving the vaccine. Overall, the question still remaining is how to best tailor HPV vaccination promotion and education programs toward the college population.

## **Purpose of the Study**

The purpose of this study was to examine why college students at Middle Tennessee State University are or are not receiving the HPV vaccination and to determine whether or not an educational event on campus increased knowledge and awareness about HPV and the HPV vaccine.

## **Research Question**

This study posed two research questions. The first research question this study sought to answer was, what are the perceived barriers to receiving the HPV vaccine among MTSU students? The second research question is, will an on-campus educational event increase knowledge and awareness about HPV and the HPV vaccine?

## **Hypothesis**

As perceived barriers are reported – such as access to transportation, access to healthcare, medical guidance, and perceived susceptibility – the likelihood that a participant has received or is planning to receive the HPV vaccination decreases. The educational health event was successful in increasing knowledge and awareness among participants regarding HPV and the HPV vaccine.

## **Significance of the Study**

This study collected pre- and post-test data from a sample of 240 undergraduate students at Middle Tennessee State University to examine health beliefs, such as perceived barriers, perceived susceptibility, and perceived severity, regarding HPV and HPV vaccination uptake. It was hypothesized that access to transportation, access to healthcare, recommendation from a trusted physician, and perceived susceptibility were significant predictors of vaccination uptake. Secondly, it was hypothesized that the on-

campus educational event was successful in both increasing knowledge and awareness about HPV and the HPV vaccine. This study adds to the literature by building off of a previously existing health promotion campaign, in addition to further exploration of perceived barriers and health beliefs of college students regarding HPV vaccination.

## CHAPTER II

### LITERATURE REVIEW

With nearly four in every five sexually active adults contracting the human papilloma virus (HPV) at some point in his or her lifetime, it is obvious that HPV is a public health concern. Despite the fact that a vaccine has been on the market and approved by the FDA since 2006, vaccination rates in the United States continue to remain lower than the national target as outlined in *Healthy People 2020*. This chapter will review the general literature of what HPV is, information about the HPV vaccine, and the targeted “catch up” population for HPV vaccination. Previous health education efforts regarding increasing HPV vaccination uptake will be examined in the final section.

#### **Human Papilloma Virus (HPV)**

##### *What is HPV?*

The Human Papillomavirus (HPV) is the most common sexually transmitted infection (STI) in the United States, with more than 150 different viral strains (Centers for Disease Control and Prevention, 2019a). This virus is in fact so prevalent, it is estimated that the majority of sexually active men and women – roughly 80% – will contract HPV at some point during their lifetime. HPV is spread through intimate contact, with vaginal and anal sex as the most common routes of transmission. Although these represent the most common routes of transmission, the virus can also be spread through engaging in oral sex. While in the majority of cases (roughly 90%) the immune system

can fight off the infection, some strains of HPV can eventually lead to genital warts, several types of cancer, and respiratory papillomatosis (Mayo Clinic, 2019).

Not every individual who contracts HPV develops an HPV-related cancer; however, those that are infected with this virus are at greater risk. According to data collected from 2012 to 2016 by the Centers for Disease Control and Prevention (2019b), roughly 44,000 HPV-related cancers occur each year in the United States. Of those, there are roughly 25,000 cases among women and 19,000 cases among men. Overall, more than 90% of anal and cervical cancers are attributable to HPV (CDC, 2019b). Additionally, nearly 70% of vaginal and vulvar cancers, 70% of oropharyngeal cancers, and over 60% of penile cancers are also linked back to HPV infection.

### ***The Burden of HPV***

Since the introduction of the Papanicolaou (Pap) screening test in the 1950s, the overall incidence of cervical cancer has been significantly reduced (Adegoke et al., 2012). Despite the fact that Pap tests have aided in the detection of cervical cancer, this disease still remains a significant cause of mortality. Perhaps the heaviest burden of HPV is the fact that 9 out of every 10 cases of cervical cancer can be traced directly back to HPV infection (National Cancer Institute, 2019). While the Pap test is a helpful tool in preventing cervical cancer mortality, vaccination for HPV is an extremely promising primary intervention strategy to continue to reduce the incidence of cervical cancer (Hirth, 2019).

In relation to the medical burden of HPV infection in the United States is the financial burden of treating HPV. The overall direct medical costs for preventing and treating HPV-related diseases is roughly \$8 billion (Chesson et al., 2012). Approximately

82% (\$6.6 billion) is specifically spent on cervical cancer screening. Routine cervical cancer screening (i.e., Pap tests) comprises roughly \$5.4 billion while the additional \$1.2 billion in costs are allocated to follow-up tests. Nearly 12% of the total cost (\$1 billion) is allocated to the treatment of cancer, with cervical cancer accounting for nearly half of that – an estimated \$441 million.

With the United States spending \$8 billion dollars annually due to HPV-related diseases such as cervical cancer, it is important to note that vaccination could greatly contribute to a reduction in this overall amount spent. By increasing vaccination rates for HPV, ultimately the rates of cervical cancer would decrease. Additionally, research suggests that the financial burden could also be reduced with an increase of vaccination rates given the relatively low costs of vaccination versus the costs of cervical cancer primary and follow-up screenings (Brisson et al., 2016; Chesson et al., 2012).

## **The HPV Vaccine**

### ***What is the HPV Vaccine?***

Although the prevalence of HPV and the link the virus has to cancer are concerning, there are vaccines readily available that reduce the incidence of HPV-related cancers. The Food and Drug Administration approved the first HPV vaccine, Gardasil, in June 2008, which provided protection against four strains of HPV (FDA, 2018). The FDA as well as the CDC closely monitor the safety of vaccines, including Gardasil. Both organizations do recommend that the general public receive the Gardasil vaccine. As of 2017, Gardasil 9 is now the only HPV vaccine available in the United States (National Cancer Institute, 2019). This updated version of the original Gardasil vaccine was approved by the FDA in December 2014 and protects against 9 different strains of HPV,

including the most common types that cause cancer and genital warts that were also included in the first release of the vaccine.

The Advisory Committee on Immunization Practices (ACIP) currently recommends the HPV vaccination for both males and females between the ages of 11 and 12 years, beginning as early as age 9 (Meites et al., 2019). If the vaccine series are initiated before the age of 15, each child needs to receive two doses of the vaccine 6 to 12 months apart. If the series are started after the age of 15, then three doses of the vaccine are required. The HPV vaccination is recommended for both males and females up to the age of 26 if he or she has not received any vaccination prior. The FDA has approved the Gardasil 9 vaccine for adults through the age of 45, although the ACIP currently does not recommend vaccination over the age of 26. While the vaccine is considered safe for ages 27 through 45, it is less beneficial for those in this age range to receive the vaccination as they have more than likely already been exposed to the virus. The ACIP does recommend that physicians take these recommendations into account on a case by case basis. If the physician believes the HPV vaccine could still be beneficial to an individual, the vaccine is encouraged to be administered.

The aforementioned recommendations have been designed by the public health community to promote immunization during the ages when the HPV vaccine will be the most effective, meaning before engagement in sexual activity and risk of exposure to the virus. Although, even if an individual is already sexually active and/or has been exposed to HPV, the vaccine can still be beneficial to protect that individual from other strands of the virus he or she may not have yet come into contact with. It is also important to note that the HPV vaccine does not treat existing HPV infections. Currently,

there is no treatment available for HPV. Therefore, prevention methods are imperative to capitalize on before potential exposure.

In regard to the efficacy of the Gardasil HPV vaccine, it has been proven to be very effective in protecting both males and females from HPV-related diseases. In a randomized clinical trial of 24,596 individuals, the Gardasil 9 vaccine was reported to have a 98% efficacy on cervical cancer, 100% efficacy on vulvar and vaginal cancer, 75% efficacy on anal cancer, and 89% efficacy in males and 99% efficacy in females for genital warts (Merck, 2018). Additionally, current research also suggests that the protection provided by the Gardasil 9 vaccine has long-lasting effects (CDC, 2019c). Longitudinal studies that have followed individuals who received the Gardasil 9 vaccine up to 10 years have shown protection provided by the vaccine remains high with no evidence suggestive of decreased protection.

### ***HPV Vaccine Disparities***

Despite the evidence that shows the HPV vaccine has been proven to be both safe and extremely effective, vaccination rates still remain lower than desired. In 2018, little more than half (51.1%) of adolescents between 13 and 17 years old were up to date with their HPV vaccine (Walker et al., 2019). While this is slightly increased from 2017 (48.6%), this is nowhere near the *Healthy People 2020* target of 80% of adolescents receiving their recommended doses of the HPV vaccine (Office of Disease Prevention and Health Promotion, n.d.).

To fully understand HPV vaccination rates and this effect on the prevalence of HPV, it is important to recognize the confusing history of vaccination recommendations. When the first Gardasil vaccination was released in 2006, the original

recommendations for vaccination coverage were licensed to be used only in females between the ages of 9 and 26 (CDC, 2007). Adding to the confusion and uncertainty of vaccine recommendations, parents viewed the HPV vaccine as protection against an STI itself, not actual prevention of potential complications linked to the STI such as cancer. Amidst this cloud of confusion was born the idea that the HPV vaccine would “increase promiscuity” in young daughters (Ratanasiripong, 2014), and thus vaccination uptake was slowed even further.

Soon after the introduction of the HPV vaccine, disparities in uptake were recognized. Among adolescents between the ages of 13 to 17, national and regional assessments have shown disparities in HPV vaccination rates by race, age, insurance and poverty level (Centers for Disease Control and Prevention, 2010c). In several studies, those that are of the African American race are associated with an increase in beginning the HPV vaccination series but have decreasing rates of HPV vaccination completion when compared to Caucasians and other races (Dempsey et al., 2011). The consistency of these findings is of great concern, given that minority women (especially African American women) are already at greater risk for HPV-related morbidity and mortality.

Additionally, geographical disparities in HPV vaccination rates have also been observed. In comparison to other regions in the US such as the North and Midwest, the Southern states have lower HPV vaccination rates (Hirth et al., 2014). Consequently, many Southern states have higher rates of cervical cancer as well. If these disparities are not addressed, the Southern region of the United States will continue to be at a higher risk for HPV-related cancers and other diseases. Unfortunately, data for geographic vaccine disparities is inadequate, therefore these disparities are not well understood.

Overall, HPV vaccination rates are not at the desired levels for public health for several reasons. Referring back to the original vaccine recommendations from 2006 for the original Gardasil vaccine, the perception of this vaccine as a “sex” vaccine has caused considerable controversy (Hirth, 2019). Additionally, the fact that the original vaccine was recommended only for females continues to hinder the levels of vaccine uptake among males. Since the first recommendations were released in 2006, multiple other recommendations have been released by the ACIP, which are outlined in the next section.

### *Timeline of HPV Vaccine Recommendations*

Since the release of the first quadrivalent HPV vaccine in 2006, recommendations established by the CDC and ACIP have changed numerous times. In the original release of the vaccine, ACIP recommendations stated that there should be routine vaccination for females only between the ages of 11 and 12 years old, beginning as early as age 9, with three doses of the quadrivalent vaccine (HPV4; Gardasil, Merck; Markowitz et al., 2007). The second and third doses were scheduled to be administered two and six months after the first dose. The catch-up range for vaccination was listed as females 13 through 26.

The next round of HPV vaccine recommendations was published in 2010. In October 2009, the FDA approved the release of a new, bivalent HPV vaccine for females aged 10 to 25 (HPV2; Cervarix, GlaxoSmithKline; CDC, 2010a). Dosing and schedules were the same for both the bivalent and quadrivalent vaccines – three doses, with the second and third doses administered two and six months after original dose beginning between 11 and 12 years of age. Additionally, the FDA licensed the

quadrivalent HPV vaccine (HPV4; Gardasil, Merck) to include males aged 9 through 26. Although, at this time, the ACIP did not recommend HPV4 for routine use among males (CDC, 2010b), even though the vaccine was known and proven to reduce the likelihood for males to contract genital warts caused by HPV. Thus, the confusion began early regarding whether males should or should not be given the HPV vaccine.

Replacing the 2009 recommendations, the ACIP released another round of HPV vaccine recommendation in 2011 to include males. This report stated that the ACIP now recommended that males aged 11 to 12 should receive the quadrivalent HPV vaccine on the same schedule and dosing as females in this age range. This report also recognizes, unlike the previous reports, that HPV also affects men further than just genital warts. It rationalizes the use of the HPV vaccine in males because HPV-associated cancers were beginning to be also detected in males (CDC, 2011). At this time, the quadrivalent vaccine was recommended for males beginning as early as 9 up through the age of 21.

Another report was released in 2014, though not much changed from the 2011 recommendations. The main difference in this report states that although the vaccine is not recommended to be initiated after the age of 26, second or third doses may be given (Markowitz et al, 2014). Females are recommended to receive either the HPV2 or the HPV4. Males are recommended only to receive HPV4.

In 2015, a third HPV vaccine was approved for clinical use. The ACIP released their recommendations to include a 9-valent HPV vaccine (Gardasil 9, Merck; Petrosky et al., 2015). The Gardasil 9 vaccine prevents against more strains of HPV for both males and females. It was approved by the FDA in December 2014 (Petrosky et al.,

2015). For those not previously vaccinated, the Gardasil 9 vaccine was also recommended for men who have sex with men through the age of 26.

In 2016, the use of a two-dose HPV vaccine schedule was released by the ACIP. These new recommendations stated that for males and females that began the vaccine series between the ages of 9 and 14 only needed to receive two doses (Meites et al., 2014). For those that initiated the vaccine series after their 15<sup>th</sup> birthday, they were still recommended to receive all three doses. These recommendations are the most current guidelines followed presently.

In the most recent updated recommendations released in 2019, the guidelines for males and females ages 9 through 26 remain the same. However, these new guidelines extend the HPV vaccine to be recommended in some cases for adults aged 27 through 45 (Meites et al., 2019). Although overall vaccination in adults is not as likely to be effective, as the HPV vaccine is most effective when administered before any kind of sexual activity, the HPV vaccine could benefit certain individuals between 27 and 45 years of age. Due to these ever-changing guidelines and recommendations, the confusion and ambiguity surrounding vaccine recommendations – especially during the time of the Ant-Vax Movement – further hinders vaccination rates for a non-required vaccine.

## **HPV and College Students**

### ***The Catch-up Population for Vaccination***

With over 14 million new cases of HPV reported each year, it is important to note that the majority of these new infections (74%) are occurring among 15 to 24-year olds (Rohde et al., 2018). That said, traditional college-aged students – those that are between the ages of 18 and 24 – are at risk for contracting HPV. Additionally, this

population is also known to engage in risky sexual behaviors that may further increase their chances for being infected with HPV (Caico, 2014). Therefore, it is imperative for public health efforts to reach this population before the traditional cut-off age of 26 for effective HPV vaccination. In a last-chance effort to protect individuals against HPV, the “catch-up” population for the HPV vaccination is generally defined as those who have not received any vaccine between the ages of 13 and 26 years old (Meites et al., 2019). Thus, while the traditional college student age bracket falls between 18 and 24 years old, this population is a great target for HPV vaccination campaigns.

Although HPV vaccination rates among adults aged 18 to 26 nearly doubled between the years of 2013 and 2018, these rates are still falling short of the national goal at 80% vaccination for both males and females (Boersma & Black, 2020; Office of Disease and Health Promotion, 2020). In an effort to further increase vaccination uptake among college students that fit into the definition of the “catch up” population, educational interventions have been shown to be effective (Hopfer, 2012). Building on a toolkit created by pharmacy students at the University of Pittsburg (Basu et al., 2018), this study attempts to enhance an educational strategy, implemented during a campus-wide health education event.

### ***Targeted Health Education for College Students***

The literature suggests that increasing knowledge regarding HPV and addressing barriers through an educational campaign can be effective at increasing HPV vaccine uptake among college students (Fontenot et al., 2014; Licht et al., 2010; Patel et al., 2012; Rohde et. al, 2018; Sandfort & Pleasant, 2009). This study primarily seeks to further the educational campaign created by Basu et al. (2018) to encourage HPV vaccine

uptake among college students as an effort to reach this “catch up” population before vaccination is no longer generally recommended.

### ***Health Belief Model (HBM) & HPV Vaccine Uptake***

To determine what factors influence vaccine uptake among college students, a survey created by Hayes et al. (2018) regarding HPV and HPV vaccination among college students was adapted. Although the authors of the original survey did not validate it, this pre-existing survey serves as a foundation to build off of to further research on this issue. Using the Health Belief Model (HBM) as the underlying theory guiding the survey, there are questions on the survey addressing perceived severity, perceived susceptibility, perceived benefits, perceived barriers, and cues to action. This model has served as the basis for numerous studies since the inception of the HPV vaccine in 2006 (Glanz et al., 2015).

Developed in the 1950s by social psychologists, the Health Belief Model (HBM) was created to explain the overall lack of participation of people regarding programs designed to prevent and detect disease (Hochbaum, 1958; Rosenstock, 1960). Included in this model are several constructs that predict whether and why individuals might take action to prevent, detect, or control illnesses and/or diseases (Glanz et al., 2015). These constructs are perceived susceptibility, perceived severity, perceived benefits, and perceived barriers to engaging in a behavior, as well as cues to action and self-efficacy.

According to Glanz et al. (2015), the overall basis of the HBM model is that individuals are inclined to engage in a health behavior if they believe several things. The first belief is that he/she is at risk of contracting an illness or disease. The second

belief is that the illness or disease could potentially have serious or unwanted consequences. The third belief is that the behavior available to them could be beneficial in reducing his/her likelihood of contracting the illness or disease or reducing the severity of the illness or disease. Fourthly, he/she must believe that there are benefits in engaging in the behavior. And lastly, the individual must believe that the perceived barriers/costs of engaging in the behavior are outweighed by the benefits of engaging in the behavior and are not strong enough to prevent the individual from taking action.

Although the survey utilized in this study does not address all of the constructs included in the HBM, the majority of constructs will serve to guide the questions. Perceived susceptibility is defined as beliefs about one's likelihood of contracting an illness or disease (Glanz et al., 2015). An example of how this construct will be measured on the survey is: "I am likely to contract HPV in my lifetime," which will be answered on a 5-point Likert scale ranging from "strongly agree" to "strongly disagree."

Another latent construct measured in the survey includes the HBM construct perceived severity. This is defined as an individual's belief of the seriousness related to contracting an illness or disease or leaving the illness untreated, which includes both physical and social consequences (Glanz et al., 2015). Perceived severity will be measured by questions such as: "Getting HPV would be a serious health problem for me," with answered ranging from "strongly agree" to "strongly disagree" on a five-item Likert scale.

Perceived benefits will be another latent construct measured, which is defined as beliefs about advantages of a recommended action or behavior to reduce threat

(Glanz et al., 2015). Benefits may reduce the threat of illness or disease or consequences of the illness or disease. This construct will be measured with several questions, including: “The HPV vaccine reduces risk of getting HPV”; “The HPV vaccine reduces the risk of getting genital warts”; and “The HPV vaccine reduces the risk of getting some types of cancer, including cervical, anal, and throat cancers.” Answer choices for these questions will be on a five-point Likert scale ranging from “strongly agree” to “strongly disagree.”

Perceived barriers are defined as potential obstacles to taking action or engaging in a behavior, which may result in negative consequences. (Glanz et al., 2015). Obstacles can include inconvenience, cost, and/or fear of a screening procedure. This latent construct will be measured with questions such as if the participant has access to a car (inconvenience) or if the participant has health insurance (cost). Additionally, questions are included on the survey about the participants’ beliefs regarding the safety and efficacy of the HPV vaccine.

Cues to action will also be a latent construct measured with this survey. Although this construct of the HBM is not well defined (Hochbaum, 1958), an example of measuring this is whether a participant received a physician’s recommendation for the HPV (Glanz et al., 2015; Rosenthal, Weiss et al., 2011).

Lastly, demographic measures will be collected, as the HBM assumes that these factors may affect beliefs and indirectly influence behaviors relative to health (Glanz et al., 2015). This survey will collect age, sex, year in school, race, sexual orientation, and relationship status for demographic information.

## **Summary**

After reviewing the literature, there is an obvious need to increase HPV vaccination uptake among college students before they reach the vaccination cut off of age 26. The literature also supports that previous efforts to target HPV vaccination uptake among this population has been successful. With modification to a pre-existing promotional program, this study will build on current literature by redirecting promotional efforts to include an educational piece. This study will examine reported perceived barriers to vaccination uptake among college students, in addition to evaluating whether or not an educational program was successful for increasing knowledge and awareness about HPV and the HPV vaccine.

## **CHAPTER III**

### **METHODOLOGY**

The purpose of this study was to examine perceived barriers and other health beliefs among college students regarding the HPV vaccination, in addition to determining the success of increasing knowledge and awareness of HPV and the HPV vaccine at an educational event on campus. The Institutional Review Board Office of Middle Tennessee State University approved all protocols of this study (Protocol ID 20-2008).

#### **Participants and Data Source**

The Toolkit “Operation Immunization The HPV Vaccine: The Red Light to Cancer” (Basu et al., 2018) was adapted and utilized at an on-campus sexual health education event. The educational event, titled the Tunnel of Love, was created by Health and Human Performance faculty member/lecturer Casie Higginbotham in an effort to raise awareness about sexually transmitted infections among college students. The event is set up every fall semester by faculty members, graduate students, and Community and Public Health undergraduates. Community partners, such as the Rutherford County Health Department, MTSU’s Health Promotion, Nashville Cares who offers free HIV testing, as well as several others set up booths outside the event to share their services with attending students. As this has been a well-established event on campus pertaining to sexual health, this served as an opportunity to educate students further about HPV and the HPV vaccine.

A month prior to the event, graduate teaching assistants met for a training session on HPV, as directed in the Toolkit. Based off the provided instructions, five posters, manned by one graduate teaching assistant, were included at the event (see Figures 1 through 5). The topics for the posters included an overview of HPV, HPV vaccine in females, HPV vaccine in males, misperceptions about HPV vaccine, and vaccine logistics. Information for each of these posters was guided by examples provided from the Toolkit. However, updated information was included in the posters used at the event. The graduate teaching assistant present at the posters answered questions and offered further explanation about HPV and the HPV vaccine to participants.

**Figure 1: Human Papillomavirus (HPV): General Information Poster**

**Human Papillomavirus (HPV): General Information**

HPV is a common virus that infects teens and adults.

80% of people will get an HPV infection in their lifetime.

**HPV VACCINE**

**What is HPV?**

The Human Papillomavirus (HPV) is a virus that is transmitted through sexual intercourse or intimate skin-to-skin contact.

**How Is HPV Spread?**

- Vaginal sexual contact
- Anal sexual contact
- Oral sexual contact

\*Infection can spread even if an individual has only one sexual partner or shows no symptoms

**Signs And Symptoms**

Most cases of HPV do not display symptoms. In some cases, warts may be present.

**Treatment and Prevention**

There is NO treatment for HPV and NO recommended test. The best way to prevent HPV and associated cancers is the HPV vaccine, pap smears and cancer/pre-cancer screenings are important!

**In the United States**

- The **most common STI**
- 80 million currently infected
- 14 million newly infected each year
- About 360,000 contract genital warts every year
- 90% of cases will clear in 2 years
- Certain strains of HPV increase risk for cancers associated with HPV
- Every year, HPV is estimated to cause nearly 35,000 cases of cancer in men and women

**HUMAN PAPILLOMAVIRUS CAN CAUSE SEVERAL TYPES OF CANCER**

ANAL, CERVICAL, ORAL, PENILE, VAGINAL, VULVAR

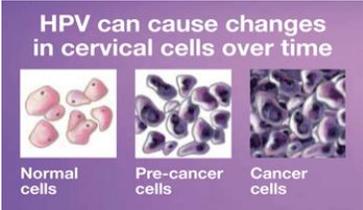
cancer.gov/hpv

**YOU ARE THE KEY TO CANCER PREVENTION**

Figure 2: HPV in Women Poster

### HPV-Associated Cancer in Women

- Cervical
- Vulvar
- Vaginal
- Anal
- Oropharyngeal (back of throat/base of tongue)



**HPV can cause changes in cervical cells over time**

Normal cells    Pre-cancer cells    Cancer cells

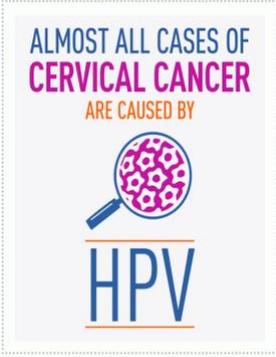
**How can you protect against cervical cancer?**

- Limit sexual partners
- Use condoms correctly and consistently
- Receive regular cervical screenings
- RECEIVE THE HPV VACCINE!

## HPV In Women



**Risks of HPV in Women**  
The biggest risk of HPV lingering in women is cervical cancer.



**MORE THAN 9 OF EVERY 10 CASES OF CERVICAL CANCER ARE CAUSED BY HPV.**

[cancer.gov/hpv](http://cancer.gov/hpv)

**How can I be screened for abnormal cervix cells?**

- ✓ Pap Smear Test
- ✓ HPV Test



**HPV Vaccine Recommendations**

Recommended age is 11-12 years old.

Women can receive vaccine up to 26 years old.

\*Even if you are already sexually active, receiving the HPV vaccine is still beneficial!



Figure 3: HPV in Men Poster

### HPV-Associated Cancer in Men

- Anal
- Penile
- Oropharyngeal (back of throat/base of tongue)



**The 8-Step Oral Cancer Screening**

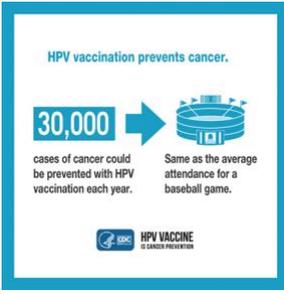
**How can men be protected against HPV?**

- ALWAYS use condoms
- Use dental dams when engaging in oral sex
- RECEIVE THE HPV VACCINE!

## HPV In Men



**Risks of HPV in Men**  
The risks of lingering HPV in men are genital warts and anal, penile, and oropharyngeal cancers.



**HPV CAUSES 70% OF ORAL CANCERS IN THE U.S.**

Men are TWICE as likely as women to develop oropharyngeal (throat) cancer.

**Why is oropharyngeal cancer a concern?**

- There is an alarming rise in the number of cancer cases seen in men.
- Recent studies predict that the cases of HPV-contracted oropharyngeal cancer in men will exceed those of cervical cancer in women.



**HPV Vaccine Recommendations**

Recommended age is 11-12 years old.

Men can receive vaccine up to 26 years old.

Even if you are already sexually active, receiving the HPV vaccine is still beneficial!



Figure 4: The HPV Vaccine & Resources Poster

## The HPV Vaccine & Resources

**What is the HPV Vaccine?**

The vaccine is a two to three-dose injection series for males and females to protect against HPV.

**HPV VACCINE  
IS CANCER PREVENTION**

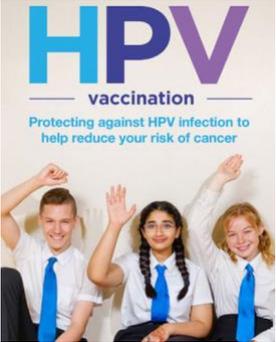
**How is the HPV vaccine administered?**

For males and females 16 years of age and older who begin the HPV vaccine series, 3 doses are required:

- First dose
- Second dose: 1-2 months after first dose
- Third dose: 6 months after first dose

**Who is the HPV vaccine for?**

- Recommended for boys and girls between ages 11 to 12
- Can be administered to males and females ages 9 to 26



**Are there safety concerns with the vaccine?**

The vaccine has been approved by the CDC and FDA as safe and effective.

Vaccines are still closely monitored.

Common side effects of vaccine: pain, swelling, redness at injection site, headache, nausea, muscle/joint pain.

**Where can I receive the HPV vaccine?**

Primary Care Physician  
Rutherford County Health Department\*  
CVS Minute Clinic  
Kroger The Little Clinic

\*Provides vaccines for those who are uninsured

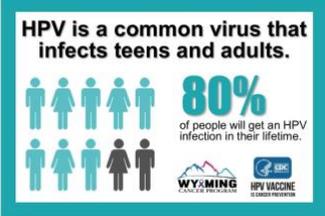


Figure 5: HPV Myths & Misconceptions Poster

## HPV Myths & Misconceptions

**MYTH:** HPV is rare.

**FACT:** HPV is the most common sexually transmitted infection.



**MYTH:** Boys don't need the vaccine because HPV only causes cervical cancer.

**FACT:** HPV can cause anal, penile, and certain throat cancers in men. The vaccine also prevents the spread of HPV to your partner(s).

**MYTH:** The HPV vaccine causes harmful side effects.

**FACT:** The vaccine's safety has been studied and verified by the FDA and CDC, with no link between vaccine and infertility identified.



**MYTH:** You can only get HPV if you have sex.

**FACT:** HPV is spread through skin-to-skin contact (any genital contact). You do NOT have to engage in sex to contract HPV.

**# OF CANCERS** attributed to HPV infections in the U.S.



**MYTH:** I can't get the HPV vaccine because I've already had sex or HPV.

**FACT:** The vaccine is still recommended to protect yourself from HPV types most commonly linked to cancer, and if you've already started the series, you can continue right where you left off.



The success of the educational event was assessed using a pre- and posttest given to voluntary participants. As participants lined up outside of the event room, those willing to take part in the survey were given a numbered packet that included an informed consent page, a short pretest, followed by a posttest. Participants were required to submit their informed consent and pretest pages from their packets upon completion to a graduate teaching assistant or present faculty member in order to enter the event. Each page of the packet was labeled with a participant number in order to later identify matched pre- and posttests for data entry.

Once the informed consent was given, the participants were asked to complete the shortened eight question pretest. This consisted of baseline questions such as if he/she has received the HPV vaccine as well as content questions about his/her knowledge of HPV. As participants finished the first two pages of the packet, the informed consent and the pretest, they separated them from the packet and gave them to a faculty member at the door of the event room.

Participants then went through the sexual health educational event, where they were presented information about HPV and the HPV vaccine. Once participants walked through the event and reviewed the five posters about HPV, they were asked to complete a revised version of the post-test (see Table 1) created by Basu, Pan, and Hayes (2018). As participants completed the posttest, a faculty member was stationed at a table at the outside of the event room to ensure students had fully completed the post-test. Participants were also provided a handout of a list of local places they could go to receive the HPV vaccine, as well as a handout created by the Centers for Disease Control and Prevention for take-home information about HPV and the HPV vaccine.

**Table 1:** Revised Survey Questions

Questions from Original Survey in Toolkit (Basu, Pan, & Hayes, 2018)	Revised Questions used for Educational Event
What is your gender?	<ul style="list-style-type: none"> <li>• What is your <i>sex</i>?*</li> <li>• Also incorporated new answer options: “Other:” and “Prefer not to answer”</li> </ul> <p>*<i>Sex</i> is the appropriate term to use in this setting to have participants report the sex they were assigned to at birth.</p>
What is your year in school?	<ul style="list-style-type: none"> <li>• Changed answer choice from “graduate or professional” to “graduate”</li> <li>• Added answer choice “I am not an MTSU student”</li> </ul>
Are you an international student?	Omitted
Where do you currently live?	Omitted
Do you consider yourself to be:	<ul style="list-style-type: none"> <li>• Changed question to: “Do you <i>identify as</i>:”*</li> <li>• Added new answer options to be more inclusive, including: Asexual, Questioning, Other, Prefer not to answer</li> </ul> <p>*It is more sensitive and appropriate to ask an individual how they identify.</p>
What is your current relationship status?	<ul style="list-style-type: none"> <li>• Added answer choice “Prefer not to answer”</li> </ul>
Do you have any kind of health insurance?	<ul style="list-style-type: none"> <li>• Added answer choice “Unsure”</li> <li>• Added answer choice “Prefer not to answer”</li> </ul>
(Not included in the original survey)	<p>New question: Who do you normally go to for medical care?</p> <ol style="list-style-type: none"> <li>a. Primary care physician</li> <li>b. Walk-in clinics (such as Minute Clinic)</li> </ol>

	<ul style="list-style-type: none"> <li>c. Urgent care</li> <li>d. Student clinic on campus</li> <li>e. Emergency room</li> <li>f. Other:</li> </ul>
(Not included in the original survey)	<p>New question: FEMALES ONLY: Have you received a gynecological exam within the past 12 months?</p> <ul style="list-style-type: none"> <li>a. Yes</li> <li>b. No</li> <li>c. Unsure</li> </ul>
Before today, have you ever heard of the Human Papillomavirus?	Changed question to: Before today, have you ever heard of the Human Papillomavirus (also referred to as HPV)?
<p>Have you ever received any doses of the HPV Vaccine?</p> <ul style="list-style-type: none"> <li>a. Yes</li> <li>b. No</li> <li>c. Unsure</li> </ul>	<p>Changed question to: Do you know if you have ever received any doses of the HPV vaccine?</p> <ul style="list-style-type: none"> <li>a. Yes, I did receive at least one dose.</li> <li>b. No, I have never received any doses. (skip to question 18)</li> <li>c. I am unsure as to whether or not I have ever received any doses. (skip to question 18)</li> </ul>
<p>(If yes), how many doses of the vaccine have you received?</p> <ul style="list-style-type: none"> <li>a. 3 doses</li> <li>b. 2 doses</li> <li>c. 1 dose</li> <li>d. Unsure</li> </ul>	<p>If you know that you have received the HPV vaccine, how many doses (shots) did you receive?</p> <ul style="list-style-type: none"> <li>a. 3 doses/shots</li> <li>b. 2 doses/shots</li> <li>c. 1 dose/shot</li> <li>d. Unsure</li> </ul>
<p>If yes, what are your reasons for obtaining the vaccine? Check all that apply.</p> <ul style="list-style-type: none"> <li>• A parent <i>had</i> me get it when I was younger</li> </ul>	<p>If you have received the HPV vaccine, what were your reasons for obtaining it? (Circle ALL that apply.)</p> <ul style="list-style-type: none"> <li>• Changed answer choice to “a parent <i>decided</i> for me to get it when I was younger</li> </ul>
If no, do you plan to receive the HPV vaccine within the next 6 months?	If you have not received the HPV vaccine, do you plan to receive the vaccine within the next 6 months?

<p>If No/Unsure, What are your reasons for not intending to obtain the vaccine? Check all that apply.</p>	<p>If you don't plan to get the vaccine or are unsure, what are your reasons for not intending to obtain the HPV vaccine? (Circle ALL that apply)</p>
<p>The session today made me aware of the importance of receiving the HPV vaccination.</p>	<p>Today made me aware of the importance of receiving the HPV vaccination.</p> <ul style="list-style-type: none"> <li>• Changed answer option from “undecided” to “unsure”</li> </ul>
<p>I am now more likely to get the vaccine in the next 6 months as the result of this session.</p>	<p>I am now more likely to get the HPV vaccine in the next 6 months as the result of this event.</p> <ul style="list-style-type: none"> <li>• Changed answer option from “neither agree nor disagree” to “unsure”</li> </ul>
<p>The HPV vaccine reduces the risk of getting HPV.</p>	<ul style="list-style-type: none"> <li>• Changed answer option from “neither agree nor disagree” to “unsure”</li> </ul>
<p>The HPV vaccine reduces the risk of getting genital warts.</p>	<ul style="list-style-type: none"> <li>• Changed answer option from “neither agree nor disagree” to “unsure”</li> </ul>
<p>The HPV vaccine reduces the risk of getting cervical cancer.</p>	<p>The HPV vaccine reduces the risk of getting some types of cancer, including cervical, anal, and throat cancers.</p> <ul style="list-style-type: none"> <li>• Changed answer option from “neither agree nor disagree” to “unsure”</li> </ul>
<p>The HPV vaccine has been very carefully tested for safety.</p>	<ul style="list-style-type: none"> <li>• Changed answer option from “neither agree nor disagree” to “unsure”</li> </ul>
<p>The HPV vaccine often causes side effects or health problems in people who receive it.</p>	<p>The HPV vaccine causes side effects or health problems in people who receive it.</p> <ul style="list-style-type: none"> <li>• Changed answer option from “neither agree nor disagree” to “unsure”</li> </ul>
<p>The HPV vaccine is generally safe.</p>	<ul style="list-style-type: none"> <li>• Changed answer option from “neither agree nor disagree” to “unsure”</li> </ul>

It is important for males to receive the HPV vaccine so that they do not spread HPV to their partners.	It is important for males to receive the HPV vaccine. <ul style="list-style-type: none"> <li>• Changed answer option from “neither agree nor disagree” to “unsure”</li> </ul>
Males do not need to receive the HPV vaccine because they cannot get cancer from HPV.	<ul style="list-style-type: none"> <li>• Changed answer option from “neither agree nor disagree” to “unsure”</li> </ul>
Receiving the HPV vaccine encourages promiscuity.	<ul style="list-style-type: none"> <li>• Changed answer option from “neither agree nor disagree” to “unsure”</li> </ul>
I am likely to contract the HPV virus in my lifetime.	<ul style="list-style-type: none"> <li>• Changed answer option from “neither agree nor disagree” to “unsure”</li> </ul>
Getting the HPV virus would be a serious health problem for me.	<ul style="list-style-type: none"> <li>• Changed answer option from “neither agree nor disagree” to “unsure”</li> </ul>
It is not necessary to get the HPV vaccine if you always use condoms.	<ul style="list-style-type: none"> <li>• Changed answer option from “neither agree nor disagree” to “unsure”</li> </ul>
As part of our HPV Vaccination initiative, we are tracking the number of students who get vaccinated... (long paragraph)	Omitted
Upon completion of this survey, you will have the opportunity to win an iPad...	Omitted
(Not included in the original survey)	It is possible to contract and/or spread HPV through oral sex. <ol style="list-style-type: none"> <li>Strongly agree</li> <li>Agree</li> <li>Unsure</li> <li>Disagree</li> <li>Strongly disagree</li> </ol>
(Not included in the original survey)	After this event, I am likely to discuss HPV with friends and/or sexual partners. <ol style="list-style-type: none"> <li>Strongly agree</li> <li>Agree</li> </ol>

	<ul style="list-style-type: none"> <li>c. Unsure</li> <li>d. Disagree</li> <li>e. Strongly disagree</li> </ul>
(Not included in the original survey)	<p>After this event, I am aware of at least one place I could go to receive the HPV vaccine.</p> <ul style="list-style-type: none"> <li>a. Strongly agree</li> <li>b. Agree</li> <li>c. Unsure</li> <li>d. Disagree</li> <li>e. Strongly disagree</li> </ul>

### Demographics

The demographic variables in this study are age, sex, year in school/classification, race, sexual orientation, and relationship status. The total number of participants in this study was  $N=240$ . Participants were asked to report their age. Sex was categorized as male, female, other, and prefer not to answer. Year in school was listed in individual answer choices from 1<sup>st</sup> year undergrad through 5<sup>th</sup> year undergrad, graduate student, not an MTSU student, and other. Race was categorized as White, Black or African America, American Indian or Alaskan Native, Asian, Native Hawaiian or Other Pacific Islander, and Other. There was an additional question asking if the participant is Hispanic or Latino. Sexual orientation data was gathered by asking the participant if he or she identified as Heterosexual (straight), Homosexual, Bisexual, Asexual, Questioning, Other, and Prefer not to answer. Relationship status was categorized as Single, Married/domestic partnership, Committed dating relationship, Separated, Divorced, Widowed, and Prefer not to answer.

## **Analysis Plan**

### ***Data Cleaning***

There are several issues that will result in excluding data from analysis. If any information is missing on the informed consent (age, name, signature, etc.), the data will be excluded. If the printed name and the signature on the informed consent do not match, the data will be excluded. Pretest survey answers will be excluded from data analysis if there is not a corresponding posttest. Pre- and posttest data will be excluded if the majority of the posttest (80% or 29 out of 36 questions) are unanswered. Pre- and posttest data will be excluded if there is an obvious pattern to selected answers on the posttest, such as answering the entire posttest with one answer choice or if there is a obvious, identifiable pattern.

### ***Statistical Analysis***

IBM's SPSS version 26 analysis module was used to analyze all data. Descriptive statistics were calculated from demographic characteristics provided by participants. To determine the effect of the educational event on health beliefs (perceived barriers and perceived susceptibility) and behavioral intention related to the HPV vaccine, we ran a paired sample t-test to compare from pretest to corresponding posttest answers ( $N = 240$ ). Each item included for evaluation of the effect of the educational event was deemed to have a response that was most and least indicative of likelihood to obtain the vaccine. Items 1 through 3 on the pretest and items 13 through 14 on the posttest (see Appendices B and C) were scored as "Yes" = 1 point, "No" = -1 point, and "Unsure" = 0 points. Item 4 was scored (18 on posttest) as "Yes" = 2 point, "Maybe" = 1 point, "No" = -1 point, and "Unsure" = 0 points. Items 5, 7, and 8 (24, 31, and 32 on

posttest) were scored as “Strongly Agree” = 2 points, “Agree” = 1 point, “Unsure” = 0 points, “Disagree” = -1 point, and “Strongly Disagree” = -2 points. The reverse of this scoring system was used for Item 6 (30 on posttest). Using this method, possible scores ranged from +13 to -12.

One-way ANCOVA analyses (controlling for age, sex, race/ethnicity, and year in school) were conducted to determine whether perceived benefits and barriers were more favorable in participants after attending the educational event (posttest) versus responses before the event (pretest). A *p*-value of less than .05 was considered statistically significant using two-tailed tests.

## **Validity of the Survey**

### ***Factor Analysis***

The original authors of the survey previously conducted factor analyses to determine how well related questions had consistent measures (e.g., did all perceived benefits items have correlated variance?) to investigate internal validity of items within their sample.

### ***Content Expert***

An expert on HPV and the HPV vaccine was asked to review the survey. With her knowledge from working on grants specific to the HPV vaccine at a large health department in Texas, she has provided her expert opinion for the content and nature of the survey questions.

## CHAPTER IV

### RESULTS

#### Demographics

Descriptive statistics were calculated to determine the demographics of the study's population. These included age, sex, year in school, race, ethnicity, sexual orientation, and relationship status (see Table 2).

**Table 2:** Participant Descriptive Statistics. For all categories,  $N=240$ .

	<i>M</i>	<i>SD</i>
<b>Age</b>	20.53	3.49
<b>Sex</b>	Frequency	Percent (%)
Female	177	73.8
Male	62	25.8
Prefer not to answer	1	0.4
<b>Year in School</b>		
1st year undergrad	75	31.3
2nd year undergrad	46	19.2
3rd year undergrad	65	27.1
4th year undergrad	41	17.1
5th year undergrad	13	5.4
<b>Race</b>		
White	107	44.6
Black or African American	93	38.8
American Indian or Alaskan		
Native	1	0.4
Asian	10	4.2
Other	29	12.1
<b>Hispanic</b>		
Yes	17	7.1
No	221	92.1
Prefer not to answer	2	0.8
<b>Sexual Orientation</b>		

Heterosexual (straight)	216	90
Homosexual	3	1.3
Bisexual	11	4.6
Questioning	2	0.8
Other	2	0.8
Prefer not to answer	6	2.5
<b>Relationship Status</b>		
Single	141	58.8
Married/domestic partnership	11	4.6
Committed dating relationship	86	35.8
Prefer not to answer	2	0.8

Note: *M*= Mean, *SD*= Standard Deviation.

### Effect of Education on Attitudes and Beliefs

The results of the paired-sample t-tests indicated that the educational event significantly increased knowledge and/or positively impacted health beliefs/attitudes regarding plans to obtain the HPV vaccine, awareness that HPV can cause cancer, and perceived susceptibility for HPV (see Table 3).

**Table 3:** Attitudes and Beliefs around HPV and the HPV Vaccine

	<i>N</i>	Pre	Post	<i>t</i>	<i>p</i>
Knowledge of HPV	239	1.24	1.19	1.704	.09
Knowledge of HPV vaccine	239	1.33	1.32	0.135	.893
Plans to get HPV vaccine	161	2.02	1.70	6.246	< .001
Awareness of cancer risk caused by HPV	240	2.11	1.73	6.937	< .001
Promiscuity	240	3.35	3.38	-0.602	.548
Perceived susceptibility	239	3.34	3.02	5.126	< .001
Perceived severity	240	1.99	1.97	0.364	.716
Total score (pre to post)	239	3.24	4.22	-6.734	< .001

Note: *N*=Number, *Pre*=Pretest, *Post*=Posttest, *t*=*t*-statistic, *p*=significance ( $p < .05$ ).

The results of the ANCOVA indicated that the educational event significantly increased knowledge and changed health beliefs regarding HPV and the HPV vaccine from pre- to posttest responses (see Table 4).

**Table 4:** Mean Differences from Pre to Posttest Scores Regarding Health Beliefs about HPV and the HPV Vaccine. For all categories,  $N=240$ .

Mean difference (from pre to post)	<i>F</i>	<i>df</i>	<i>p</i>
Plans to get HPV vaccine	1.864	40	.005
Awareness of cancer risk caused by HPV	4.320	47	< .001
Promiscuity	1.866	47	.002
Perceived susceptibility	1.422	47	.009
Perceived severity	3.231	47	< .001

*Note:*  $F=F$ -statistic,  $df=$ degrees of freedom,  $p=$ significance ( $p<.05$ ).

According to posttest answers, 95.8% of participants (227 out of 240) stated that because of the educational event, they recognized the importance of the HPV vaccine. Additionally, 68.1% of participants (154 out of 240) stated that they were more likely to get the HPV vaccine because of the educational event.

Following the educational event, 79.1% of participants (189 out of 240) report that they are likely to discuss HPV with friends and/or sexual partners. After the event, 92.5% of participants (221 out of 240) reported that they are aware of at least one place they could go to receive the HPV vaccine.

#### **Determinants Reported to Obtain or not to Obtain HPV Vaccine**

Also resulting from posttest data, it was observed that participants were more likely to have received the vaccine if they received either parental or physician support (see Table 5), which addresses the Health Belief Model (HBM) construct cues to action. Parental feelings also played a substantial role in those who had not received the vaccine and/or reported that they did not plan to receive the vaccine (see Table 6).

**Table 5:** Reasons Students at MTSU Reported Receiving the HPV Vaccine. For all categories,  $N=100$ .

	Frequency	Percent (%)
Parent decided	42	42.0
Parent encouraged	24	24.0
To prevent cancer	29	29.0
To prevent warts	18	18.0
To prevent spreading HPV to partner	16	16.0
Physician recommendation	51	51.0
Friend encouraged	4	4.0
Other	6	6.0

**Table 6:** Reasons Students at MTSU reported they do not plan to get the HPV vaccine. For all categories,  $N=83$ .

	Frequency	Percent (%)
Don't need it	30	36.1
Vaccine is not safe	11	13.3
Vaccine is not effective	1	1.2
Parents did not want me to get it	17	20.5
Friend discouraged me to get it	0	0.0
Afraid the shot will hurt	4	4.8
Cost of vaccine	5	6.0
No insurance coverage	10	12.0
Don't know where to get vaccine	15	18.3
Transportation to get vaccine	7	8.4
No time to get vaccine	5	6.0
Other	19	22.9

## **CHAPTER V**

### **DISCUSSION**

This study examined the effect of an on-campus educational event on knowledge, attitudes, and health beliefs regarding HPV and the HPV vaccine among college students. The results of the analyses concluded that the event successfully improved knowledge while also positively changing attitudes and health beliefs based on pre- and posttest data. An important note about this study is that the sample is representative of the Middle Tennessee State University's undergraduate population with respect to race/ethnicity based on the most recent data (Middle Tennessee State University, 2019).

#### **Influence of Control Variables**

As noted in the Results chapter, there were differences in results of the t-test and the ANCOVA. It is important to recognize that while not all variables were significant ( $p < .05$ ) in the results of the paired samples t-test, all variables were significant in the results of the ANCOVA. This is explained by the controls that were included in the ANCOVA, whereas the t-test was simply the analysis of the raw data. The variables that were controlled for in the ANCOVA included age, sex, year in school, and race/ethnicity.

These variables were important to control for in this particular study because of the nature of the vaccine and the vaccine recommendations. Age is important, as there is a "cut-off" age of 26 for eligibility to receive the HPV vaccine (Meites et al., 2019). For this reason, year in school is also important in relation to age and/or potential knowledge about the vaccine and HPV. Sex (gender) is important, as there are differences in the

rates of males and females that receive the HPV vaccine (Thompson et al., 2016). Lastly, race/ethnicity was controlled for as it is known that this can be an influential factor for HPV vaccine initiation as well as vaccine series completion (Dempsey et al., 2011; Joseph et al., 2014).

### **Health Beliefs about HPV and the HPV Vaccine**

This study found that an educational event on campus can influence health beliefs in college students regarding HPV and the HPV vaccine. Survey questions were designed to measure constructs from the Health Belief Model (HBM), including perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and cues to action. From the results of the current study, providing an educational intervention significantly increased knowledge and awareness about the HPV vaccine, improved participants' knowledge of perceived susceptibility, and increased participants' perception surrounding the severity of HPV-related diseases. These results are similar to those observed from Basu et al. (2018) when testing the HPV Toolkit. Their educational intervention also significantly increased knowledge and changed health beliefs.

Similar to other studies, this study found that a physician recommendation and parental support are predictive factors for determining those who have received the HPV vaccine as well as for those who do not plan to get the HPV vaccine. It is known that a physician recommendation is a high predictor for receiving the HPV vaccine and acts as a cue to action, a construct of the Health Belief Model (Gilkey et al., 2016; Rosenthal et al., 2011). Additionally, it is imperative to onboard parental support for the HPV vaccine, even for the college-age populations. While parental support is known to be an important factor for adolescents to be vaccinated (Gilkey et al., 2018), there is also other research to

support our findings that parental support continues to be an influence on college students' decisions to obtain the HPV vaccine (Patel et al., 2012).

The findings of this study support the previous research that health education and promotion can be and are successful at increasing knowledge and positively changing health beliefs about HPV and the HPV vaccine among college students. It is also interesting to note that while the majority of participants were female, who historically have always been included in HPV vaccine recommendations, the educational event still significantly increased knowledge and awareness surrounding HPV and the HPV vaccine. Additionally, this study supports the use of the Health Belief Model in studies regarding HPV vaccine uptake among the college student population.

### **Qualitative Responses**

Though the vast majority of the survey were quantitative questions, there were two questions that had a qualitative component. For the questions asking participants why they had gotten the HPV vaccine or why they do not plan to get the vaccine, there was an "Other" answer response option with space for writing their explanation.

In response to the reasons why a participant had received the HPV vaccine, a total of six selected "Other." Three participants answered that they had gotten the vaccine because of school, with one participant stating his/her school provided two doses. Though currently the HPV vaccine is not required for most schools, some private institutions as well as public schools in Rhode Island, Virginia, Puerto Rico, and Washington D.C. do require the HPV vaccine (National Conference of State Legislatures, 2020). One participant wrote in "military." Although the participant did not specify if his/her military branch required or encouraged HPV vaccine uptake, the Defense Health Agency (DHA)

and each branch of the military do have policies encouraging and offering HPV vaccination. However, it is not considered a mandatory vaccine for United States military service members (Defense Health Agency, 2018). One participant wrote in that it was “required for my green card.” According to the United States Citizenship and Immigration Services (USCIS, 2020), from August 1, 2008 through December 13, 2009 the HPV vaccine was required for any female green card applicants between the ages of 11 through 26 years. The requirement was eliminated on December 14, 2009.

In response to the reasons why a participant stated that he/she did not have plans to get the HPV vaccine in the next six months, 19 selected “Other.” The most common answers were not knowing if he/she had already received the HPV vaccine ( $N=7$ ) or general uncertainty about that vaccine, with some stating they wanted to discuss it further with their medical provider ( $N=5$ ). Two participants stated they were over the age to receive the vaccine. One stated that they were choosing to abstain from sex until marriage while another stated that she was marrying a virgin. One stated that he/she did not “have time to get other doses,” which is a known perceived barrier. Lastly, one participant shared that she had already been diagnosed with cancer related to HPV and had received a hysterectomy. For future studies, it may be relevant to have resources that could be supportive to any participant who has received a diagnosis of an HPV-related disease/illness.

### **Limitations**

One of the main limitations to this study was that a convenience sample was used. Additionally, due to the relatively small sample size ( $N=240$ ) out of a very large college population ( $N= 19,461$  total undergraduate enrollment in Fall 2019; MTSU, 2019),

results from this study cannot be generalized to reflect the health beliefs and behaviors of all students at the University or to all college students collectively. Overall, females represented the majority of participants (73.8%) in the survey. However, this phenomenon has been explained in previous research, as females are known to respond to surveys at a higher rate than males (Cheung et al., 2017).

Using the word “promiscuity” in both the pre- and posttest questions is also a limitation due to the fact that college students may or may not know the definition. This is reflected in the results of the analyzed data, as the majority of participants reported that they were “unsure” on both the pre- and posttest if receiving the HPV vaccine encouraged promiscuity. It is important to remember that it is recommended for any health education/promotion materials, including surveys, to be written at or below the 5<sup>th</sup> grade level for reading and comprehension (Stossel et al., 2012).

Additionally, it is important to note that there were pre- and posttests that were not included in the data analysis ( $N=19$ ), as outlined in the plan for data cleaning in the Methodology chapter. Of the 19 surveys that were excluded in data analysis, four were female and 15 were male. This is important to note because if the 15 male participant data were included, a potentially more even split of the sexes could have been observed in the results. Over half ( $N=10$ ) of the data that were excluded were posttests surveys that had an easily detected pattern for answer choices, meaning that all questions were answered the same for all questions asking their agreeance. As participants were incentivized to participate for potential extra credit for class(es), this could have influenced the decision to randomly mark answers. Three participants’ surveys were excluded from data entry because they were under the age of 18. A participant was

required to be 18 years or older to participate in this study, as outlined by the IRB approval and informed consent. Two participants did not sign their informed consent and were excluded from data entry. Another two participants were excluded from data analysis because they did not complete either their pre- or posttest. One participant was excluded from data entry, as it was discovered during the educational event that he completed his pretest after attending the event. Therefore, he had already been exposed to the educational materials related to questions on the pretest. One other participant was excluded from data entry as unfortunately there was not a participant ID number on the posttest and therefore could not be matched to a pretest.

One other participant was excluded from data analysis. The participant was not a student (wrote in that she was a member of the university's staff) and was 66 years old. Due to the fact that this study focused specifically on college students, this participant's data was excluded because she did not fit into the population's defined age group, nor was she a college student.

Due to the fact that extra credit was offered to certain participants to attend the educational event and participate in the survey, selection bias is a limitation to this study. It was apparent during the data cleaning process that some participants completed the survey without thought or care in order to receive the extra credit. Reporting bias could also be a limitation of this study, depending on whether or not a participant felt as though there was a "correct" answer when asked if he/she had received or was willing to receive the HPV vaccine. This could potentially cause an over-estimation of those who either have gotten the vaccine or those who plan to get the vaccine.

Lastly, bias could have been introduced in this study during data entry and analysis. Although the data cleaning plan was written before data entry, the personal investigator solely entered data herself. Therefore, the person responsible for coding and analyzing all data had a personal vested interest and/or stake in the results of this study.

### **Challenges of the Study**

There are several reasons as to why this study is scientifically difficult. The first reason is that recommendations for the vaccine have changed throughout the years, as noted in the Literature Review chapter. Depending on the age of the participant and the age of vaccine initiation, participants may have received or were required to receive a different number of doses. Therefore, when asked how many doses a participant had received, one potentially could have seen the answer option to have gotten 3 doses and thought that he/she needed another dose. Because of this, some may have responded to the question of whether or not they were more likely to get the vaccine because of the educational event when in reality they have already received all of their doses.

Additionally, asking a participant to recall whether or not he/she had received the HPV vaccine is an ambiguous and potentially leading question. A participant's initial response may have been "Yes, I have received the HPV vaccine" if he/she is unaware that this vaccine is not required, thinking she had gotten all of the required shots. Therefore, responses to the question whether participants had received the HPV vaccine could potentially be falsely inflated.

Another challenge regarding this study and any study encouraging HPV vaccine uptake is the stigma surrounding this vaccine. As stated in the Literature Review, this vaccine has been called the "sex vaccine," thought to encourage promiscuity (Hirth,

2019). This belief comes from the idea that when adolescents receive a vaccine that is known to prevent a sexually transmitted infection (STI), they will be encouraged to engage in risky sexual behaviors and have multiple partners. However, this is known to be false. Receiving the HPV vaccine is not correlated with promiscuity or promiscuous behaviors (Hirth, 2019). Although, this stigma is important to be cognizant of when discussing the HPV vaccine, especially in areas such as the South (Hirth et al., 2014).

### **Recommendations and Conclusions**

The purpose of this study was to determine the effectiveness of an educational event on health beliefs regarding HPV and the HPV vaccine among college students. It found that health education can significantly improve knowledge and positively change health beliefs surrounding HPV and the HPV vaccine. This study supports current literature and expands on the project completed by Basu et al (2018). For future educational events to target any audience – parents, college students, physicians, etc. – it is important to reiterate and emphasize that the HPV vaccine is cancer prevention. This fact should be the foundation for the educational program or health promotion event to ensure the best chance for success (Gilkey et al., 2018).

Potential suggestions for the methodology of this intervention include utilizing an online survey software (such as Survey Monkey or SAP Qualtrics) and revising the survey questions. By using an online tool, skip logic can be utilized to ensure questions that should not be answered (for example, males should not answer the question about having received a gynecological exam within the last 12 months). Using a survey software will also eliminate the tedious work of manual data entry.

Another suggestion for revision to the methodology is addressed in the limitations. Removing the word “promiscuity” in the question designed to ask participants if this is a barrier is imperative, as the majority of participants responded with “unsure” for both pre- and posttest answers. Additionally, it is strongly recommended to have more questions on the pretest to match those on the posttest (such as questions about whether HPV can cause throat cancer, as this is becoming more and more prevalent) for a more robust analysis of the data collected.

Looking at the posttest data, it appears that the educational event may not have adequately provided participants with resources and information regarding where to get the HPV vaccine. In this study, participants were provided a list of resources within the community that offer the vaccine after the posttest was completed. Although this information was listed on one of the posters presented at the event, 15 participants still reported that they did not plan to get the vaccine because they did not know where to get it. Therefore, in future studies, it is recommended to provide resource lists prior to the completion of posttest surveys to more adequately assess whether or not this is an existing barrier even after the educational event. Additionally, having resources present at an educational event for those who have been diagnosed with an HPV-related illness may be beneficial as one of the participants in this study had received a cancer diagnosis.

Overall, this study supports current literature and adds to the literature regarding HPV and the HPV vaccine. Continued efforts to educate college students as well as other populations are imperative to reduce the impact and burden HPV has in the United States. There is currently no treatment for HPV. However, the HPV vaccine is indeed cancer prevention.

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## **APPENDICES**

# APPENDIX A

## Institutional Review Board Approval

### IRB

INSTITUTIONAL REVIEW BOARD  
Office of Research Compliance,  
010A Sam Ingram Building,  
2269 Middle Tennessee Blvd  
Murfreesboro, TN 37129



### IRBN001 - EXPEDITED PROTOCOL APPROVAL NOTICE

Thursday, April 09, 2020

Principal Investigator **Katherine Witcher (Student)**  
Faculty Advisor **Bethany Wrye**  
Co-Investigators **Kahler Stone**  
Investigator Email(s) **kaw6q@mtmail.mtsu.edu; bethany.wrye@mtsu.edu; kahler.stone@mtsu.edu**  
Department **Health and Human Performance**  
Protocol Title **HPV vaccine in college students**  
Protocol ID **20-2008**

Dear Investigator(s),

The above identified research proposal has been reviewed by the MTSU Institutional Review Board (IRB) through the **EXPEDITED** mechanism under 45 CFR 46.110 and 21 CFR 56.110 within the category (7) *Research on individual or group characteristics or behavior*. A summary of the IRB action and other particulars in regard to this protocol application is tabulated below:

IRB Action	<b>APPROVED for ONE YEAR</b>		
Date of Expiration	<b>9/30/2020</b>	Date of Approval	9/11/19
Sample Size	500 (FIVE HUNDRED)		
Participant Pool	Target Population 1: Primary Classification: <b>General Adults (18 or older)</b> Specific Classification: <b>MTSU students</b> Target Population 2: Primary Classification: <b>N/A</b> Specific Classification: <b>N/A</b>		
Exceptions	NONE		
Restrictions	<b>1. Mandatory SIGNED informed consent.</b> <b>2. All identifiable data/artifacts that include audio/video data, photographs, handwriting samples, and etc., must be used only for research purpose and they must be destroyed after data processing.</b> <b>3. Mandatory Final report (refer last page).</b>		
Approved Templates	MTSU templates: Informed Consent Template for Signature Non-MTSU Templates: Verbal recruitment script		
Comments	1. The recruitment flyer is not permitted for human subject recruitment 2. Amendment in response to COVID-19 outbreak		

### Post-approval Actions

The investigator(s) indicated in this notification should read and abide by all of the post-approval conditions (<https://www.mtsu.edu/irb/FAQ/PostApprovalResponsibilities.php>) imposed with this approval. Any unanticipated harms to participants, adverse events or compliance breach must

IRBN001

Version 1.4

Revision Date 06.11.2019

be reported to the Office of Compliance by calling 615-494-8918 within 48 hours of the incident. All amendments to this protocol, including adding/removing researchers, must be approved by the IRB before they can be implemented.

**Continuing Review (The PI has requested early termination)**

Although this protocol can be continued for up to THREE years, The PI has opted to end the study by 8/31/2022. The PI must close-out this protocol by submitting a final report before 8/31/2022. Failure to close-out may result in penalties including cancellation of the data collected using this protocol.

**Post-approval Protocol Amendments:**

Only two procedural amendment requests will be entertained per year. In addition, the researchers can request amendments during continuing review. This amendment restriction does not apply to minor changes such as language usage and addition/removal of research personnel.

Date	Amendment(s)	IRB Comments
04/09/2020	Data storage location is temporarily altered to meet COVID-19 emergency operations mandated by MTSU. The student PI will access the data as described in the amendment petition and will return the data back to its original location once the analysis is complete.	IRBA2020-129

**Other Post-approval Actions:**

Date	IRB Action(s)	IRB Comments
NONE	NONE.	NONE

**Mandatory Data Storage Requirement:** All research-related records (signed consent forms, investigator training and etc.) must be retained by the PI or the faculty advisor (if the PI is a student) at the secure location mentioned in the protocol application. The data must be stored for at least three (3) years after the study is closed. Subsequently, the data may be destroyed in a manner that maintains confidentiality and anonymity of the research subjects.

The MTSU IRB reserves the right to modify/update the approval criteria or change/cancel the terms listed in this letter without prior notice. Be advised that IRB also reserves the right to inspect or audit your records if needed.

Sincerely,

Institutional Review Board  
Middle Tennessee State University

Quick Links:

- Post-approval Responsibilities: <http://www.mtsu.edu/irb/FAQ/PostApprovalResponsibilities.php>
- Expedited Procedures: <http://www.mtsu.edu/irb/FAQ/PostApprovalResponsibilities.php>

## APPENDIX B

### Pretest Survey

#### PRE-TEST FOR TUNNEL OF LOVE Participant # \_\_\_\_\_

1. Before today, have you ever heard of the Human Papillomavirus (also referred to as HPV)?
  - a. Yes
  - b. No
  - c. Unsure
  
2. Before today, have you ever heard of the HPV vaccine (other names: Gardasil, Cervarix)?
  - a. Yes
  - b. No
  - c. Unsure
  
3. Do you know if you have ever received any doses of the HPV vaccine?
  - a. Yes, I did receive at least one dose.
  - b. No, I have never received any doses.
  - c. I am unsure as to whether or not I have ever received any doses.
  
4. If you are unsure or have not received the HPV vaccine, do you have any plans to get the vaccine?
  - a. Yes
  - b. Maybe
  - c. No
  - d. Unsure
  
5. The HPV vaccine reduces the risk of getting some types of cancer, including cervical, anal, and throat cancers.
  - a. Strongly Agree
  - b. Agree
  - c. Unsure
  - d. Disagree
  - e. Strongly Disagree
  
6. Receiving the HPV vaccine encourages one to engage in sexual relations with many people.
  - a. Strongly Agree
  - b. Agree
  - c. Unsure
  - d. Disagree
  - e. Strongly Disagree
  
7. I am likely to contract HPV in my lifetime.
  - a. Strongly Agree
  - b. Agree

- c. Unsure
- d. Disagree
- e. Strongly Disagree

8. Getting HPV would be a serious health problem for me.
- a. Strongly Agree
  - b. Agree
  - c. Unsure
  - d. Disagree
  - e. Strongly Disagree

## APPENDIX C

### Posttest Survey

# POST-TEST FOR TUNNEL OF LOVE

Participant# \_\_\_\_\_

1. What is your age in years?
  
2. What is your sex?
  - a. Male
  - b. Female
  - c. Other: \_\_\_\_\_
  - d. Prefer not to answer
  
3. What is your year in school at MTSU?
  - a. 1<sup>st</sup> year undergrad
  - b. 2<sup>nd</sup> year undergrad
  - c. 3<sup>rd</sup> year undergrad
  - d. 4<sup>th</sup> year undergrad
  - e. 5<sup>th</sup> year undergrad
  - f. Graduate student
  - g. I am not an MTSU student
  - h. Other
  
4. What is your race?
  - a. White
  - b. Black or African American
  - c. American Indian or Alaskan Native
  - d. Asian
  - e. Native Hawaiian or Other Pacific Islander
  - f. Other
  
5. Are you Hispanic or Latino?
  - a. Yes, I am Hispanic or Latino
  - b. No, I am not Hispanic or Latino
  - c. Prefer not to answer
  
6. Do you have a car available to you on campus?
  - a. Yes
  - b. No
  
7. Do you identify as:
  - a. Heterosexual (straight)
  - b. Homosexual

- c. Bisexual
  - d. Asexual
  - e. Questioning
  - f. Other
  - g. Prefer not to answer
8. What is your current relationship status?
- a. Single
  - b. Married/domestic partnership
  - c. Committed dating relationship
  - d. Separated
  - e. Divorced
  - f. Widowed
  - g. Prefer not to answer
9. Do you have any kind of health insurance?
- a. Yes
  - b. No
  - c. Unsure
  - d. Prefer not to answer
10. Who do you normally go to for medical care?
- a. Primary care physician
  - b. Walk-in clinics (such as the Minute Clinic)
  - c. Urgent care
  - d. Student clinic on campus
  - e. Emergency room
  - f. Other: \_\_\_\_\_
11. Have you received a physical/medical check-up in the last 12 months?
- a. Yes
  - b. No
  - c. Unsure
12. FEMALES ONLY: Have you received a gynecological exam within the past 12 months?
- a. Yes
  - b. No
  - c. Unsure
13. Before today, have you ever heard of the Human Papillomavirus (also referred to as HPV)?
- a. Yes
  - b. No
  - c. Unsure
14. Before today, have you ever heard of the HPV vaccine (other names: Gardasil, Cervarix)?
- a. Yes
  - b. No
  - c. Unsure
15. Do you know if you have ever received any doses of the HPV vaccine?
- a. Yes, I did receive at least one dose.

- b. No, I have never received any doses. (skip to question 18)
  - c. I am unsure as to whether or not I have ever received any doses. (skip to question 18)
16. If you know that you have received the HPV vaccine, how many doses (shots) did you receive?
- a. 3 doses/shots
  - b. 2 doses/shots
  - c. 1 dose/shot
  - d. Unsure
17. If you have received the HPV vaccine, what were your reasons for receiving it? (**Circle ALL that apply**)
- a. A parent decided for me to get it when I was younger
  - b. A parent encouraged me to get it
  - c. I wanted to prevent myself from getting cancer
  - d. I wanted to prevent myself from getting genital warts
  - e. I wanted to prevent spreading HPV to my sexual partners
  - f. My physician or other health care provider recommended the vaccine
  - g. A friend encouraged me to get it
  - h. Other (please specify):
- 
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18. If you have not received the HPV vaccine, do you plan to receive the vaccine within the next 6 months?
- a. Yes (skip to question 20)
  - b. No
  - c. Unsure
19. If you don't plan to get the vaccine or are unsure, what are your reasons for not intending to obtain the HPV vaccine? (**Circle ALL that apply**)
- a. I do not think I need it
  - b. I am concerned the HPV vaccine is not safe
  - c. I do not believe the HPV vaccine is effective
  - d. My parents never told me to get it or did not want me to get it
  - e. A friend has discouraged me from getting it
  - f. I am afraid it will hurt
  - g. The vaccine costs too much
  - h. I do not have insurance coverage for the vaccine
  - i. I do not know where to get the HPV vaccine
  - j. I do not have good transportation to a place where I can get the HPV vaccine
  - k. I do not have time to get the HPV vaccine
  - l. Other please specify:
- 
- 
20. Today made me aware of the importance of receiving the HPV vaccination.
- a. Strongly Agree
  - b. Agree
  - c. Unsure

- d. Disagree
  - e. Strongly Disagree
21. I am now more likely to get the HPV vaccine in the next 6 months because of this event.
- a. Strongly Agree
  - b. Agree
  - c. Unsure
  - d. Disagree
  - e. Strongly Disagree
22. The HPV vaccine reduces the risk of getting HPV.
- a. Strongly Agree
  - b. Agree
  - c. Unsure
  - d. Disagree
  - e. Strongly Disagree
23. The HPV vaccine reduces the risk of getting genital warts.
- a. Strongly Agree
  - b. Agree
  - c. Unsure
  - d. Disagree
  - e. Strongly Disagree
24. The HPV vaccine reduces the risk of getting some types of cancer, including cervical, anal, and throat cancers.
- a. Strongly Agree
  - b. Agree
  - c. Unsure
  - d. Disagree
  - e. Strongly Disagree
25. The HPV vaccine has been very carefully tested for safety.
- a. Strongly Agree
  - b. Agree
  - c. Unsure
  - d. Disagree
  - e. Strongly Disagree
26. The HPV vaccine causes side effects or health problems in people who receive it.
- a. Strongly Agree
  - b. Agree
  - c. Unsure
  - d. Disagree
  - e. Strongly Disagree
27. The HPV vaccine is generally safe.
- a. Strongly Agree

- b. Agree
  - c. Unsure
  - d. Disagree
  - e. Strongly Disagree
28. It is important for males to receive the HPV vaccine.
- a. Strongly Agree
  - b. Agree
  - c. Unsure
  - d. Disagree
  - e. Strongly Disagree
29. Males do not need to receive the HPV vaccine because they cannot get cancer from HPV.
- a. Strongly Agree
  - b. Agree
  - c. Unsure
  - d. Disagree
  - e. Strongly Disagree
30. Receiving the HPV vaccine encourages promiscuity.
- a. Strongly Agree
  - b. Agree
  - c. Unsure
  - d. Disagree
  - e. Strongly Disagree
31. I am likely to contract HPV in my lifetime.
- a. Strongly Agree
  - b. Agree
  - c. Unsure
  - d. Disagree
  - e. Strongly Disagree
32. Getting HPV would be a serious health problem for me.
- a. Strongly Agree
  - b. Agree
  - c. Unsure
  - d. Disagree
  - e. Strongly Disagree
33. It is not necessary to get the HPV vaccine if you always use condoms.
- a. Strongly Agree
  - b. Agree
  - c. Unsure
  - d. Disagree
  - e. Strongly Disagree

34. It is possible to contract and/or spread HPV through oral sex.
- a. Strongly Agree
  - b. Agree
  - c. Unsure
  - d. Disagree
  - e. Strongly Disagree
35. After this event, I am likely to discuss HPV with friends and/or sexual partners.
- a. Strongly Agree
  - b. Agree
  - c. Unsure
  - d. Disagree
  - e. Strongly Disagree
36. After this event, I am aware of at least one place I could go to receive the HPV vaccine.
- a. Strongly Agree
  - b. Agree
  - c. Unsure
  - d. Disagree
  - e. Strongly Disagree