DEVELOPMENT AND VALIDATION OF A THEORY OF PLANNED BEHAVIOR-BASED INSTRUMENT TO PREDICT HUMAN PAPILLOMAVIRUS VACCINATION INTENTIONS OF COLLEGE MALES AT A SOUTHEASTERN UNIVERSITY

by

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ABSTRACT

Background. Human papillomavirus (HPV) is the most prevalent sexually transmitted infection in the United States. College-age males influence acquisition and transmission of HPV due to engagement in high-risk sexual behaviors. HPV vaccination is an efficacious strategy for reducing the burden of HPV-associated morbidity; yet rates of HPV vaccination remain low among college males. The purpose of this study was to operationalize the direct constructs of the theory of planned behavior (TPB) to predict the HPV vaccination behavioral intentions of male undergraduate college students attending a large public southeastern university. Methods. A non-experimental, cross-sectional study design was employed with 256 vaccine-eligible college males. Instrumentation comprised a qualitative elicitation study, face and content validity by a panel of seven experts, readability and comprehensibility by pilot test, stability reliability by test-retest, internal consistency applying Cronbach’s alpha, construct validity applying confirmatory factor analysis, and predictive validity applying structural equation modeling. Results. Approximately one third (31.3%) of the sample was unaware of HPV and nearly half (45.3%) of the sample was unaware of the HPV vaccine. The final structural model exhibited acceptable fit of the data (Chi-square test, $\chi^2 = 129.78$; degrees of freedom, $df = 70, p = .000$; Kline’s alternative, $KA = 1.854$; Goodness-of-fit index, $GFI = 0.932$; Normed fit index, $NFI = .948$; Root mean square error of approximation, $RMSEA = 0.054$). Attitude toward the behavior and subjective norm were significant predictors of behavioral intention, accounting for 58% of the variance in behavioral intention. Perceived behavioral control was found to be a non-significant predictor of behavioral intention. Overall, college males reported low behavioral intentions to get
the vaccine ($M = 8.52; \text{SD} = 5.30$). Discussion. A valid and reliable instrument designed to measure constructs from the TPB was developed to predict HPV vaccination intentions of college males. Findings from this study provided an instrument that may be applied in the design and evaluation of TPB-based interventions to promote HPV vaccination among undergraduate college males. Future research may examine possible mediators and moderators of TPB constructs to fully operationalize the theoretical framework.
DEDICATION

This dissertation is dedicated to my parents, Carolyn H. Priest and Timothy W. Priest.

This project would not have been possible without their unconditional love and support throughout my life.
LIST OF ABBREVIATIONS AND SYMBOLS

\( \alpha \)  Cronbach’s index of internal consistency

ATT  Attitude toward the behavior

CFA  Confirmatory factor analysis

\( df \)  Degrees of freedom: number of values free to vary after certain restrictions have been placed on the data

\( F \)  Fisher’s F ratio: A ratio of two variances

GFI  Goodness-of-fit index

HPV  Human papillomavirus

IHE  Institution of higher education

KA  Kline’s alternative

\( M \)  Mean: the sum of a set of measurements divided by the number of measurements in the set

\( Mdn \)  Median: the middle number in a given sequence of numbers listed in numerical order

NFI  Normed fit index

\( p \)  Probability associated with the occurrence under the null hypothesis of a value as extreme as or more extreme than the observed value

PBC  Perceived behavioral control

PI  Principal investigator

\( r \)  Pearson product-moment correlation

SEM  Structural equation modeling
SN  Subjective norm
TPB  Theory of planned behavior
TRA  Theory of reasoned action
RMSEA  Root mean square error of approximation
\( \chi^2 \)  Chi-square test
<  Less than
=  Equal to
ACKNOWLEDGMENTS

The old African adage, “It takes a village to raise a child” is also applicable to the dissertation process. Indeed, it has taken a village to bring my dissertation project to fruition. I would like to thank the faculty, colleagues, friends, and family members who have helped me along the way.

First, I would like to thank my committee members for their time, knowledge, and encouragement. Dr. Leeper, you helped me to hone my statistical knowledge and skills, and for that, I am grateful. I am fortunate to have had the opportunity to learn from you. Thank you for your flexibility and willingness to provide feedback throughout this entire project. Dr. Usdan, thank you for sharing your college health insight and procedural knowledge about working with the IRB. Your wit and sense of humor helped to make the process more fun. Dr. Paschal, you have been a source of encouragement throughout this entire process. Thank you for your considerate review, thoughtful questions, and insightful feedback. Dr. Knowlden, you have been integral to my development as a health education researcher. You have spent countless hours advising me on this project, and have served as a constant source of motivation. Thank you for believing in my abilities, sharing your statistical and methodological expertise, and coaching me to the finish line. Dr. Birch, it has been an honor and a privilege to work closely with you over the past three years. Your wisdom, passion for health education, collegial spirit, and genuine love of learning are inspiring. Thank you for your continuous input and guidance on this project, and for always challenging me to see beyond the horizon. I am forever indebted to you for your invaluable mentorship.
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To my brother, Aaron, thank you for providing a refreshing outlook and reminding me to take time to enjoy life amidst the chaos. Mom and Dad, thank you for instilling in me the drive to succeed, and the resilience to accomplish whatever I set my mind to do. One of my primary motivations in life is to make my family proud. Michael, thank you for always finding a way to make me laugh, and encouraging me to persevere in the face of tough challenges. As Billy Jean King once said, “Pressure is a privilege.” I am blessed to have had you on this journey, and the best is yet to come.

Lastly, to all of my friends, teachers, coaches, family, and colleagues who are not named here, thank you for serving as an inspiring force in my life, and helping to shape my path. I would not be where I am without each of you.
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CHAPTER 1
INTRODUCTION

Background

Human papillomavirus (HPV) is the most common sexually transmitted infection in the United States, with approximately 79 million Americans currently infected with the virus (Satterwhite et al., 2013). While more than 150 types of HPV exist, approximately 40 types may be sexually transmitted, with the potential to infect tissues of the anus, mouth, esophagus, penis, and vaginal tract (Bernard et al., 2010). An estimated 14 million Americans are newly infected with HPV annually and nearly half of those infections develop in persons 15 to 24 years of age. Between 2003 and 2006, the prevalence of HPV infection among U.S. females 14 to 59 years of age was 42.5%, with the highest prevalence (53.8%) reported among females 20 to 24 years of age (Hariri et al., 2011). A cohort study of heterosexually active male university students, 18 to 20 years of age reported a 62.4% cumulative incidence of HPV infection of any type at 24 months (Partridge et al., 2007). More recently, a large multinational cohort study among men 18 to 70 years of age reported a 50% prevalence of HPV infection at baseline, with a 30% and 38% prevalence of oncogenic and nononcogenic strains, respectively (Giuliano et al., 2011a).

HPV is commonly transmitted through oral, vaginal, and anal sex (Centers for Disease Control and Prevention [CDC], 2014a). In rare cases, the virus may be transmitted through manual-genital contact or from mother to infant during delivery (Fairley, Gay, Forbes, Abramson & Garland, 1995; Watts et al., 1998). The majority of HPV infections clear on their own within two years; however, persistent HPV infection can cause anogenital warts, and anal, cervical,
oropharyngeal, penile, vaginal, and vulvar precancers and cancers, as well as recurrent respiratory papillomatosis (RRP) (CDC, 2012, 2014a; Lacey, Lowndes, & Shah, 2006). HPV is projected to cause 91% of cervical and anal cancers, 72% of oropharyngeal cancer, 63% of penile cancer, 75% of vaginal cancer, and 69% of vulvar cancer (CDC, 2014b).

Although males and females have similar rates of genital HPV infection, immune responses differ by biological sex (Giuliano et al., 2008; 2011a; Partridge et al., 2007). A greater percentage of females are HPV-seropositive (17.9%) than males (7.9%), and have higher titers of antibodies (Dunne, Nielson, Stone, Markowitz, & Giuliano, 2006; Stone et al., 2002). According to Giuliano et al. (2011b), the lower immune response to natural HPV infection among males “may partially explain the higher prevalence of HPV infections as compared with the prevalence among females, and the constant prevalence and incidence of HPV infection across a wide age range in males” (p. 402). Females have historically endured the greatest burden of cancer caused by HPV; consequently, prevention efforts have largely targeted females (Fontenot & Morelock, 2012). As a result, cervical cancer rates in the United States have declined significantly; conversely, oral and anal HPV-associated cancer rates have increased (Chaturvedi, 2010). While females are disproportionately affected by genital HPV-associated cancer, males are disproportionately affected by oral HPV-associated cancer (Chaturvedi et al., 2011). A large population based study found that the prevalence of oral HPV infections was significantly higher for males (10.1%) than females (3.6%), even after controlling for sexual behavior (Gillison et al., 2012).

In June 2006, the United States Food and Drug Administration (FDA) approved Gardasil®, the quadrivalent HPV vaccine (4vHPV), to protect females ages 9 to 26 from anogenital warts, precancerous lesions, and anogenital cancer caused by four (types 6, 11, 16,
and 18) of the most burdensome strains of HPV (U.S. Food and Drug Administration, 2006). In October of 2009, the FDA approved Gardasil® to prevent genital warts among males ages 9 to 26. The quadrivalent vaccine, recombinant, was also approved to prevent anal cancer and precancerous lesions among males and females ages 9 to 26 (U.S. Food and Drug Administration, 2009b; U.S. Food and Drug Administration, 2010). Cervarix®, the bivalent HPV vaccine (2vHPV) that protects against two cancer-causing HPV strains (types 16 and 18), was approved for use among females ages 9 to 26 was also approved in October of 2009 (U.S. Food and Drug Administration, 2009a). In December of 2014, the FDA approved Gardasil®9, the nine-valent vaccine recombinant (9vHPV) to protect females ages 9 to 26 and males ages 9 to 15 from nine HPV types (6, 11, 16, 18, 31, 33, 45, 52, and 58) responsible for anogenital warts and anal, cervical, vaginal, and vulvar precancers and cancers (U.S. Food and Drug Administration, 2014a). The 2vHPV, 4vHPV, and 9vHPV are likely effective for prevention of oropharyngeal cancer caused by HPV, but data from clinical trials are not currently available (Herrero et al., 2013; Steinau et al., 2014).

The Advisory Committee on Immunization Practices (ACIP) is a federal advisory committee, which provides expert advice and recommendations to the CDC Director regarding the use of vaccines (and similar agents) for disease control and prevention in the U.S. population (Markowitz et al., 2014; Petrosky et al., 2015). The ACIP recommends routine HPV vaccination with one of the FDA-approved vaccines with the 3-dose series for females (2vHPV, 4vHPV, 9vHPV) and males (4vHPV or 9vHPV) at age 11 or 12. Vaccination with 2vHPV, 4vHPV, or 9vHPV is recommended for females 13 through 26 years of age who have not been vaccinated previously or who have not completed the HPV vaccine series (Markowitz et al., 2014; Petrosky et al., 2015). For males who have not been vaccinated previously or who have not completed the
HPV vaccine series, vaccination is recommended for males 13 through 21 years of age.

Specifically, the 4vHPV is recommended for males ages 11 to 21 years of age, though males between the ages of 22 and 26 may also be vaccinated with 4vHPV. The ACIP recommends that men with compromised immune systems and men who have sex with other men (MSM) through age 26 should receive the 4vHPV vaccine if not previously vaccinated (Petrosky et al., 2015).

The 9vHPV is only recommended for males between the ages of 11 and 15 years. A summary of the HPV vaccines and ACIP vaccine-specific recommendations is provided in Table 1.1.

Table 1.1

*Summary of Vaccine Characteristics and Advisory Committee on Immunization Practice’s HPV Vaccine Recommendations*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Bivalent (2vHPV)</th>
<th>Quadrivalent (4vHPV)</th>
<th>9-valent (9vHPV)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brand name</strong></td>
<td>Cervarix</td>
<td>Gardasil</td>
<td>Gardasil 9</td>
</tr>
<tr>
<td><strong>VLPs</strong></td>
<td>16, 18</td>
<td>6, 11, 16, 18</td>
<td>6, 11, 16, 18, 31, 33, 45, 52, 58</td>
</tr>
<tr>
<td><strong>Manufacturer</strong></td>
<td>GlaxoSmithKline</td>
<td>Merck &amp; Co, Inc.</td>
<td>Merck &amp; Co, Inc.</td>
</tr>
<tr>
<td><strong>Recommendations by Biological Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Female</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Females ages 11–12 years (ideal time)</td>
<td></td>
<td>Females ages 11–12 years (ideal time)</td>
<td>Females ages 11–12 years (ideal time)</td>
</tr>
<tr>
<td>• Females ages 13–26 who have not been vaccinated previously or who have not completed the HPV vaccine series</td>
<td></td>
<td>Females ages 13–26 who have not been vaccinated previously or who have not completed the HPV vaccine series</td>
<td>Females ages 13–26 who have not been vaccinated previously or who have not completed the HPV vaccine series</td>
</tr>
<tr>
<td>• Not available for males</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Male</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Males ages 11–12 years (ideal time)</td>
<td></td>
<td>Males ages 11–12 years (ideal time)</td>
<td>Males ages 11–12 years (ideal time)</td>
</tr>
<tr>
<td>• Males ages 13–21 who have not been vaccinated previously or who have not completed the HPV vaccine series</td>
<td></td>
<td>Males ages 13–21 who have not been vaccinated previously or who have not completed the HPV vaccine series</td>
<td>Males ages 13–21 who have not been vaccinated previously or who have not completed the HPV vaccine series</td>
</tr>
<tr>
<td>• For males with compromised immune systems and men who have sex with other men, vaccination through age 26 is recommended</td>
<td></td>
<td></td>
<td>Males ages 13–15 who have not been vaccinated previously or who have not completed the HPV vaccine series</td>
</tr>
</tbody>
</table>

*Note. VLPs = virus-like particles*
Prior to the introduction of the HPV vaccines, approximately $8 billion was spent on direct medical costs associated with HPV each year in the United States (Chesson et al., 2012). Current national estimates indicate that 21,000 HPV-associated cancers could be prevented annually through HPV vaccination (CDC, 2014a). Accordingly, HPV vaccination is positioned as the most efficacious strategy to reduce HPV-associated morbidity.

Although adolescent and young adult males are at high risk for HPV infection, HPV vaccine initiation and series completion are low among this population. Estimates from 2012 indicate that as few as 2.3% of males ages 19 to 26 had received one or more doses of HPV vaccine, compared to 34.5% of females in the same age group (Williams et al., 2014). HPV vaccine coverage was 2.4% for males 19 to 21 years of age versus 44.3% among females 19 to 21 years. In 2013, only 34.6% of boys 13 to 17 years of age had received at least one dose of the HPV vaccine, and only 13.9% had completed the vaccine series (Stokley et al., 2014). A national study conducted in Spring 2014 reported that only 29% of college males had received the HPV vaccine, compared to 59% of their female counterparts (American College Health Association [ACHA], 2014a). Increasing HPV vaccine uptake among college-age males is imperative because this population is at high risk for contracting and transmitting HPV.

Theoretical Framework

Theory is integral to health education practice because it can help to explain why individuals do or do not engage in specific health behaviors and assist with behavior change (Glanz, Rimer & Viswanath, 2008). Additionally, theory assists health education specialists with planning, implementing, and evaluating interventions aimed to promote healthy behavior change or maintenance (National Cancer Institute, 2005). Fishbein and Ajzen conceptualized the theory of reasoned action (TRA) to improve understanding of the relationships between attitudes,
intentions, and behaviors (Fishbein, 1967). Specifically, Fishbein and Ajzen (1975) delineated underlying behavioral and normative beliefs, intentions, and behavior, as well as how these constructs could be measured. The TRA asserts that behavioral intention is the most immediate antecedent of behavior (Ajzen, 1991). Behavioral intention is a person’s readiness to perform a given behavior (Francis et al., 2004). According to the TRA, behavioral intention is determined by attitude toward the behavior and subjective norm. Attitude toward the behavior refers to an individual’s overall feeling that the behavior is favorable or unfavorable (Ajzen, 2006a). Subjective norm is an individual’s estimate of the social pressure to perform or not perform a behavior (Francis et al., 2004). The TRA has been applied to various behaviors including exercise, condom use, cyberbullying perpetration, HPV vaccination, and cervical cancer screening (Albarracin, Fishbein, Johnson & Muellerleile, 2001; Barling & Moore, 1996; Doane, Pearson, Kelley, 2014; Downs & Hausenblas, 2005; Fisher, Kohut, Salisbury & Salvadori, 2013). The TRA is based on the assumption that behavior is voluntary; therefore, success of the TRA in predicting behavior is dependent on the degree to which the behavior is under volitional control (Glanz et al., 2008).

The theory of planned behavior (TPB), an extension of the TRA, added the perceived behavioral control construct to more effectively predict behavioral intention. Perceived behavioral control is the extent to which an individual believes they are able to perform the behavior (Francis et al., 2004). The theory of planned behavior is a robust yet parsimonious model that is highly predictive of human action (Ajzen, 1991). The TPB has been tested in predicting behavioral intention and behavioral change in over 1,000 empirical studies (Ajzen, 2014b). The TPB has been widely used to predict a number of behaviors among college-age males, including leisure, sleep, exercise, condom use, heavy episodic drinking, testicular self-

The TPB is a value-expectancy theory, which assumes that human behavior is rooted in logical thought processes. Value-expectancy theories postulate that individuals will perform a given behavior if they believe the personal benefits of the action’s outcome will exceed any negative outcomes that may occur due to engaging in the behavior (Hays, 1985). Specifically, the TPB posits that changing behavioral, normative, and control beliefs will alter behavioral intention, and subsequently, behavior.

**Statement of the Problem**

Due to cervical cancer being the most common cancer caused by HPV, and the first HPV vaccine being available to females since 2006, the majority of HPV primary prevention efforts and HPV vaccination research has targeted females. However, vaccinating both biological sexes is necessary to reduce the overall HPV-related health burden (Fontenot & Morelock, 2012). Unfortunately, adolescent and young adult males, specifically those of college age, have commonly been overlooked in HPV vaccination research and prevention programs. Of the social and behavioral science HPV vaccination research that has targeted males, most studies examined demographic or descriptive factors associated with HPV vaccine acceptability and uptake (Newman, Logie, Doukas, & Asakura, 2013). While this research is informative, most of these predictors are static factors that provide limited insight about leverage points to increase HPV vaccine initiation and series completion. Therefore, theory-based research is needed to identify
variables that impact HPV vaccination intentions and behavior of college males and can be targeted in an intervention.

The health belief model (HBM) and the theory of planned behavior are two of the most widely used theories to explain and predict health behaviors. The HBM posits that health behavior is determined by personal beliefs or perceptions about a disease and the strategies available to decrease its occurrence (Hochbaum, 1958). Moreover, HBM addresses an individual's perceptions of threat posed by a health problem (e.g., severity, susceptibility), benefits of avoiding the threat, and factors that influence the decision to act (i.e., barriers, cues to action, and self-efficacy) (Champion & Skinner, 2008). HBM has been used to predict a variety of behaviors including but not limited to mammography, influenza vaccination, hepatitis B virus (HBV) vaccination, and HPV vaccination (Champion, 1999; Chen, Fox, Cantrell, Stockdale & Kagawa-Singer, 2007; de Wit, Vet, Schutten & van Steenbergen, 2005; Wheldon, Buhi & Daley, 2012).

The HBM and TPB were compared in predicting college women’s HPV vaccine uptake or intention in two separate studies; both studies reported that the TPB consistently outperformed the HBM based on amount of variance explained (Bennett, Buchanan & Adams, 2012; Gerend & Shepherd, 2012). Bennett et al. (2012) determined that the TPB explained 52% of the variance in intentions to vaccinate while Gerend et al. (2012) reported that the TPB explained 39% of the variance in vaccine uptake. When HBM and TPB constructs were combined into one model, the HBM constructs only accounted for an additional 4% beyond that explained by the TPB constructs (Gerend et al., 2012). Fisher et al. (2013) tested the TPB in predicting HPV vaccination intentions of college-age students, and found that attitudes and social norms accounted for 53% and 44% of the variance in women’s and men’s vaccination intentions,
respectively. Based on these findings, the TPB appears to be the most useful framework for predicting HPV vaccination intentions among college males.

Priest and Knowlden (2015) conducted a systematic review of primary prevention HPV interventions \((n = 12)\) targeting college students worldwide and reported a deficit of interventions that were theory-based and included males. Among the interventions identified, only four of the twelve interventions included males; and only one exclusively targeted males. One-third \((n = 4)\) of the interventions mentioned a theoretical framework, but only two operationalized or reified any constructs of the theories that were discussed. Thus, it was not possible to determine if the interventions effectively targeted or changed the theoretical constructs. While theory-based interventions that target college males are needed, it is critical that interventionists select appropriate theoretical constructs that may be operationalized and reified. Compared to atheoretical interventions, theory-based interventions are more efficient with allocating resources and more effective at changing behavior (Sharma & Romas, 2010). Creation of a theory-based measurement tool will aid in identifying constructs that influence college males’ HPV vaccination intentions, and subsequently the development of effective interventions to increase HPV vaccination within this population.

**Purpose of the Study**

The purpose of this study was to operationalize the direct constructs of the TPB to predict the HPV vaccination behavioral intentions of male undergraduate college students attending a large public southeastern university. This study represented the first investigation to conduct an elicitation study to identify salient opinions about HPV vaccination with college males. Further, this study was the first to operationalize behavioral intention as intent to get all three doses of the HPV vaccine series within 12 months. Previous HPV vaccination studies operationalized
behavioral intention more generally, excluding dosage information (Bennett et al., 2012; Fisher et al., 2013; Gerend et al., 2012; Wheldon et al., 2012). Dosage information within the context of a specified time frame has the potential to influence college-age males’ behavioral intention to get vaccinated (Daley et al., 2010a; Daley et al., 2011). This study provided a comprehensive measure of behavioral intentions aligned with current U.S. immunization guidelines and epidemiological research.

This instrument was designed to measure theory-based correlates of HPV vaccination intentions and aid in designing, implementing, and evaluating TPB-based HPV vaccination interventions for college males. HPV vaccination interventions targeting college males could result in significantly reduced morbidity associated with anogenital cancers and warts, and provide some cross-protection for females who have sex with males in this population.

**Research Questions**

The following questions were investigated in this study:

1. What is the relationship between attitude toward the behavior and behavioral intention to get all three doses of the HPV vaccine in the next 12 months among college males?

2. What is the relationship between subjective norm and behavioral intention to get all three doses of the HPV vaccine in the next 12 months among college males?

3. What is the relationship between perceived behavioral control and behavioral intention to get all three doses of the HPV vaccine in the next 12 months among college males?
4. To what extent do the constructs of attitude toward the behavior, subjective norm, and perceived behavioral control predict behavioral intention to get all three doses of HPV vaccine in the next 12 months among college males?

The TPB-based model to predict college males’ behavioral intention to get all three doses of the HPV vaccine in the next 12 months is illustrated in Figure 1.

Figure 1.1. Theory of planned behavior-based model for predicting behavioral intention to get all three doses of the HPV vaccine in the next 12 months among college males. Adapted from “The theory of planned behavior,” by Ajzen, 1991, Organizational Behavior and Human Decision Processes, 50, p. 179-211.

Hypotheses

Behavioral intention, the endogenous variable, was investigated to address the proposed research questions. The exogenous variables included attitude toward the behavior, subjective norm, and perceived behavioral control. All variables were operationalized as continuous variables. Selection of variables was based on the theory of planned behavior framework (Ajzen, 1991). Two separate sets of hypotheses investigating the proximal TPB constructs were explored
in this study: (i) tests for relationships between individual exogenous variables and behavioral intention and (ii) test for significance of exogenous variables regressed on behavioral intention. A total of four hypotheses were explored in this study. Significance levels to reject the null hypotheses was set \textit{a priori} at \( p < 0.05 \).

**Hypotheses set one: Tests for relationships between individual exogenous variables and behavioral intention.** Hypotheses set 1 tested the relationship between the exogenous variables of attitude toward the behavior, subjective norm, and perceived behavioral control on behavioral intention. Exogenous variables were selected based on the proximal TPB constructs and pertinent literature.

1. **Null hypothesis:** Attitude toward the behavior (ATT) will not have a significant relationship with behavioral intention (BI) to get all three doses of the HPV vaccine in the next 12 months among college males.

   \[ H_0: r_{ATT|BI} = 0 \]

   **Alternative hypothesis:** Attitude toward the behavior (ATT) will have a significant relationship with behavioral intention to get all three doses of the HPV vaccine in the next 12 months among college males.

   \[ H_A: r_{ATT|BI} \neq 0 \]

2. **Null hypothesis:** Subjective norm (SN) will not have a significant relationship with behavioral intention (BI) to get all three doses of the HPV vaccine in the next 12 months among college males.

   \[ H_0: r_{SN|BI} = 0 \]
Alternative hypothesis: Subjective norm (SN) will have a significant relationship with behavioral intention (BI) to get all three doses of the HPV vaccine in the next 12 months among college males.

\[ H_A: r_{SN|BI} \neq 0 \]

3. Null hypothesis: Perceived behavioral control (PBC) will not have a significant relationship with behavioral intention (BI) to get all three doses of the HPV vaccine in the next 12 months among college males.

\[ H_0: r_{PBC|BI} = 0 \]

Alternative hypothesis: Perceived behavioral control (PBC) will have a significant relationship with behavioral intention (BI) to get all three doses of the HPV vaccine in the next 12 months among college males.

\[ H_A: r_{PBC|BI} \neq 0 \]

Hypothesis set two: Test for significance of exogenous variables regressed on behavioral intention. Hypothesis set 2 tested the significance of attitude toward the behavior, subjective norm, and perceived behavioral control to predict behavioral intention to get all three doses of the HPV vaccine in the next 12 months (Y) among college males.

4. Null hypothesis: The constructs of attitude toward the behavior (\( \beta_1 \)), subjective norm (\( \beta_2 \)), and perceived behavioral control (\( \beta_3 \)) combined together will not significantly predict behavioral intention to get all three doses of the HPV vaccine in the next 12 months (Y) among college males.

\[ H_0: \beta_1 = \beta_2 = \beta_3 = 0 \]
**Alternative hypothesis:** The constructs of attitude ($\beta_1$), subjective norm ($\beta_2$), perceived behavioral control ($\beta_3$), combined together will significantly predict behavioral intention to get all three doses of the HPV vaccine in the next 12 months ($Y$) among college males.

$$H_A: \beta_1 = \beta_2 = \beta_3 \neq 0 \text{ OR } \beta_j \neq 0 \text{ for one or more } j$$

**Operational Definitions**

The operational definitions below provided measurement parameters for the variables investigated in this study, including number of items per construct, and score ranges for each of the constructs.

**Attitude toward the behavior.** This TPB construct is universally defined as an individual’s overall feeling that a behavior is favorable or unfavorable. For the purpose of this study, attitude toward the behavior was operationally defined as an individual’s general feeling of like or dislike toward getting all three doses of the HPV vaccine in the next 12 months. The attitude to get all three doses of HPV vaccine in the next 12 months, which is referred to throughout this study as attitude toward the behavior, was measured with a 7-point, semantic differential rating scale. This construct was assessed by questionnaire items 4 to 10 and yielded a total attitude toward the behavior score range from 7 to 49.

**Behavioral intention.** This TPB construct is defined as an individual’s readiness to perform a given behavior and is posited as an immediate antecedent to behavior (Ajzen, 1991). The behavioral intention construct was developed in terms of target, action, context, and time (TACT) (Francis et al., 2004). For the purpose of this study, behavioral intention was defined as a college male’s (target) intention or readiness to get (action, as in get HPV vaccine) all three doses (context) of the HPV vaccine in the next 12 months (time). Behavioral intention was
measured with a 7-point semantic differential rating scale. The behavioral intention construct was assessed by questionnaire items 1 to 3, and yielded a score range from 3 to 21.

**College males.** For the purpose of this study, *college males* were defined as biologically male, undergraduate students enrolled at The University of Alabama, between the ages of 18 and 26, who had not taken any doses of the HPV vaccine.

**Perceived behavioral control.** This TPB construct is generally defined as the extent to which an individual believes they are able to perform a behavior. In this study, the *perceived behavioral control* construct was defined as the extent to which a person believes they are in control of getting all three doses of HPV vaccine in the next 12 months. This construct was measured with a 7-point semantic differential rating scale. The perceived behavioral control construct was assessed by questionnaire items 15 to 20 and yielded an overall perceived behavioral control score that ranged from 6 to 42.

**Subjective norm.** This TPB construct is generally defined as an individual’s estimate of perceived social pressure to perform or not perform a behavior. For the purpose of this study, *subjective norm* was defined as an individual’s general belief that significant people in their lives think they should or should not get all three doses of the HPV vaccine in the next 12 months. This construct was measured with a 7-point semantic differential scale. The subjective norm construct was assessed by questionnaire items 11 to 14 and yielded an overall subjective norm score that ranged from 4 to 28.

**Delimitations**

Participation in this study was delimited to college males between 18 and 26 years of age, who had not received any doses of HPV vaccine, enrolled in classes in the Spring 2015 semester within the College of Human Environmental Science (CHES) and the Culverhouse College of
Commerce and Business Administration (Business Communications sections only) at The University of Alabama. Consequently, the findings of this study are not generalizable beyond the study participants. Lastly, this study examined behavioral intention as the endogenous variable rather than actual behavior.

Limitations

This study included several limitations that may have impacted interpretation of the results. Participant responses were based on self-report, thus the results are subject to social desirability bias and recall bias. For instance, participants may have been hesitant to share information about their HPV vaccination intentions, because the vaccine is for a disease that is primarily transmitted through sexual contact. To reduce the likelihood of social desirability bias, the instrument was delivered electronically. Participants were informed their responses were confidential. Another limitation is that participants might have misinterpreted items on the instrument, which could have skewed participant responses. A fourth limitation is that all study participants were recruited with non-probability convenience sampling, which is prone to sampling bias; therefore, the results cannot be generalized beyond the study participants. Further, a large proportion of participants were recruited from health-related courses for the pilot test and test-retest, so those results are susceptible to response bias, which also limits the generalizability of the results. A sixth limitation is the use of a cross-sectional design, which despite being commonly employed in social and behavioral science research, inhibits the ability to infer causation or establish a temporal relationship between variables. A seventh limitation is that the TPB is an intrapersonal level theory; although it considers normative influences, it does not directly address interpersonal, economic, environmental, or political factors that may influence an individual’s intention to engage in a behavior (Boston University School of Public Health,
Additionally, the TPB has inherent limitations such as the assumption that behavioral decisions are rooted in rational thought. Consequently, TPB does not account for affective factors that may influence behavioral intention such as fear, threat, or mood. Finally, this study only investigated the proximal TPB constructs; therefore, generalizations about the strength and saliency of behavioral, normative, and control beliefs could not be drawn. Since the primary goal of this study was to test a TPB-based prediction model, assessing the proximal constructs was deemed adequate (Ajzen, 2014a; Ajzen & Fishbein, 1980).

Assumptions

The following assumptions were made when interpreting the study results. It was assumed that participants responded to instrument questions honestly and accurately. Provided the rigor of the instrumentation process, which included qualitative pilot testing, it was assumed that misinterpretation of questionnaire items was minimal. Another assumption was that the convenience sample was satisfactorily representative of the undergraduate male population at UA.

Summary

In this chapter, an overview of HPV and HPV vaccine was presented. HPV infection is a salient public health issue that affects millions of Americans each year. HPV vaccination is presented as the most efficacious primary prevention strategy to reduce the burden of HPV-associated morbidity. A rationale for studying HPV vaccination intentions of college males was provided in this chapter, followed by the proposed research questions, hypotheses, operational definitions, delimitations and assumptions of the study. The origin and prevalence of HPV, economic and health consequences of HPV infection, HPV prevention methods, benefits and limitations of HPV vaccination, vaccine coverage, priority populations, prior HPV and HPV
vaccine education efforts, and theory-based HPV vaccination research specific to college students will be discussed in Chapter 2. The proposed methodology is described in Chapter 3. The study results are presented in Chapter 4, followed by the conclusions drawn and implications for practice in Chapter 5.
CHAPTER 2
LITERATURE REVIEW

Human papillomavirus (HPV) infection is a salient public health issue linked to negative physical, mental, and social outcomes. HPV is the most common sexually transmitted infection in the United States, with recent estimates indicating that 79 million Americans are currently infected with the virus (Satterwhite et al., 2013). HPV is associated with genital warts, recurrent respiratory papillomatosis, as well as anal, cervical, oropharyngeal, penile, vaginal, and vulvar cancers. While no cure exists for the virus, three HPV vaccines are available which have the ability to prevent infection from the most burdensome types of the virus. The purpose of this study was to operationalize the direct constructs of the theory of planned behavior (TPB) to predict the HPV vaccination behavioral intentions of male undergraduate college students attending a large public southeastern university. In this chapter, the origin, transmission, and prevalence of HPV, economic and health consequences of HPV infection, HPV prevention methods, benefits and limitations of HPV vaccination, vaccine coverage, priority populations, previous HPV and HPV vaccine education efforts, and theory-based HPV vaccination research specific to college students are discussed.

**Origin of Human Papillomavirus**

The papilloma virus was discovered in 1933, when the virus was isolated from cottontail rabbits (Kaufman, Adam & Vonka, 2000; Shope & Hurst, 1933). In 1935, two scientists discovered that papillomas could transform into malignant tumors (Kaufman et al., 2000; Rous, 1935). The human papillomavirus was discovered in 1956 when two scientists found that
squamous cells developed from the virus (Koss & Durfee, 1956). They referred to the squamous cells as koilecytotic atypia or koilocytosis, which is derived from the Greek word, koilos meaning, “hollow” (Koss et al., 1956). Until the invention of cloning techniques in the 1970s, there was limited advancement in HPV research, primarily because the HPV virus does not grow in culture (Burk, 1999). During 1983 and 1984, zur Hausen and his research team cloned HPVs 16 and 18, which enabled researchers to explore the structure of the virus (Boshart et al., 1984; Dürst, Gissmann, Ikenberg & zur Hausen, 1983)

Virology

Papillomaviruses, including HPV, are small, circular, non-enveloped, double-stranded, deoxyribonucleic acid (DNA) viruses that infect human epithelial cells (CDC, 2012a). The HPV genome encodes for 6 nonstructural early proteins (E1, E2, E4, E5, E6, E7) that are necessary for virus replication, and 2 late proteins, L1 and L2, which are the viral structural proteins (Paavonen, 2007). More than 150 types of HPV exist, which are uniquely numbered based on differences in the genetic sequence of the outer capsid protein L1 (Bernard et al., 2010; Dunne & Markowitz, 2006). Most HPV types infect cutaneous epithelial cells that cause skin warts. Approximately 40 HPV types are known to infect the mucosal epithelium, the mucous-secreting tissues of the body, including tissues of the anus, mouth, esophagus, penis, and vaginal tract (Doorbar et al., 2012). HPV is known to cause anal, cervical, penile, vaginal, and vulvar intraepithelial neoplasias; cancer of the cervix, oropharynx, penis, vagina, and vulva; condylomata acuminata (anogenital warts) and recurrent respiratory papillomatosis (RRP) (Chaturvedi, 2010; Chaturvedi et al., 2011; De Vuyst, Clifford, Nascimento, Madeleine & Franceschi, 2009; Kashima & Shah, 1987; Wikström, Hedblad & Syrjänen, 2012).
The onset of the aforementioned diseases and carcinomas are largely attributable to high-risk (HR) or low-risk (LR) HPVs, which are classified based on epidemiological evidence demonstrating the association of specific HPV strains with cancer (Rocha-Zavaleta et al., 2004; zur Hausen, 1996). HR-HPV strains (types 16, 18, 26, 31, 33, 35, 39, 45, 51, 52, 53, 56, 58, 59, 66, 68a, 69, 73, 82-subtype) can cause low-grade cell abnormalities, high-grade cell abnormalities that can serve as antecedents to cancer, and anogenital cancers (Muñoz et al., 2003). LR-HPVs strains (types 6, 6a, 6b, 11, 40, 42, 43, 44, 54, 61, 70, 72 and 81) can cause anogenital warts and RRP (Muñoz et al., 2003; Muñoz, Castellsagué, de González & Gissman, 2006).

**Testing for HPV Infection**

The virus cannot be cultured from patient specimens; consequently, the HPV test requires detecting HPV genetic information. Cellular specimens are required to detect HPV DNA. In 2014, the FDA approved a clinical HPV test for the detection of clinically significant levels for any of 14 high-risk HPV types (16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, 66, 68) using cervical specimens (Markowitz et al., 2014). HPV tests are approved for use with females who are 30 years and older as part of a Papanicolaou (Pap) test, or age 21 years or older to follow-up on a Pap test result that was abnormal (CDC, 2012a). Although the FDA approved the first HPV test for primary cervical cancer screening of females ages 25 and older in April of 2014, it is not currently included as part of national recommendations (U.S. Food and Drug Administration, 2014b). In the United States, HPV tests are not approved or recommended for use in males, or at sites other than the cervix (Markowitz et al., 2014).

Polymerase chain reaction (PCR) assays are used to detect whether or not HPV is present, and then type-specific hybridization is used to determine the specific HPV type.
Specifically, nucleic acid amplification techniques that produce type-specific results are most commonly used in epidemiologic and basic research studies of HPV. However, approximately 125 HPV tests have been identified worldwide, but many have not been validated (Polijak et al., 2012). While HPV DNA tests identify current HPV infection in the cervix, HPV serology may be used to measure current or past infection, or vaccination within research settings. Virus-like Particle (VLP)-based enzyme-linked immunoassays are the most commonly used HPV serologic assays, and are designed to detect antibodies to the L1 viral protein. However, serologic assays do not have any clinical purpose and are only available in research settings. This is likely because antibodies are not always detectable in individuals who are infected with HPV, and there is no gold standard for a threshold for a positive antibody result (Edelstein et al., 2011).

**HPV Prevalence and Incidence**

Genital HPV is the most common sexually transmitted infection in the United States. Approximately 79 million Americans are currently infected with HPV, and 14 million Americans are newly infected with HPV each year (Satterwhite et al., 2013). HPV infections accounted for approximately 72% of all existing sexually transmitted infections (STI), including chlamydia, gonorrhea, syphilis, Herpes Simplex-2, Hepatitis B, HIV, and Trichomoniasis, and 71% of all newly acquired STI in 2008. Of this sample, HPV infection prevalence rates were highest among men ages 15 to 24 years old. More specifically, the highest prevalence of HPV infection occurred in 20 to 24 year-olds, which includes men of traditional college age: 53.8%, 95% CI [45.9, 61.5]. More recently, a large cohort study of men aged 18–70 residing in Brazil, Mexico, and the United States reported a 50% prevalence of HPV infection, with a 30% prevalence of oncogenic types, and a 38% prevalence of nononcogenic types at baseline (Giuliano et al., 2011a).
Studies of HPV incident infection suggest that HPV infection typically occurs within the first few years of becoming sexually active. A cohort study of heterosexually active males aged 18 to 20 attending a university in the United States reported a 62.4% cumulative incidence of HPV infection of any type at 24 months (Partridge et al., 2007). A prospective study of females attending a university in the United States reported a cumulative probability of incident HPV infection of 38.9% at 24 months after their initial sexual intercourse (Winer et al., 2003). For females, the risk of incident HPV infection appears to increase with age until the early 20’s and then decrease; in contrast, studies have found that the incidence of HPV infection among males is relatively stable across a broad age range (Satterwhite et al., 2013; Giuliano et al., 2011a).

**HPV Transmission and Natural History**

HPV can be transmitted through direct skin contact during peno-vaginal and peno-anal intercourse, oral sex, and digital-vaginal sex (Fairley, Gay, Forbes, Abramson & Garland, 1995; Gillison, 2008; Winer et al., 2003). In rare cases, HPV can be vertically transmitted from an infected mother to the oropharyngeal mucosa of their infant during childbirth, although the risk for transmission is higher during vaginal delivery than cesarean section (Smith et al., 2010; Tseng et al., 1998). HPV, unlike most viruses, exclusively infects the epithelial cells in the body because it cannot survive in blood or other bodily fluids (Winer et al., 2003). The skin is comprised of epithelial cells, which provide multiple layers of protection for the body. Epithelial cells make up the mucous membranes and line all major organs and orifices on the body. Mucous membranes act as a barrier to protect the organs from infections and diseases. HPV transmission occurs when the infected epithelial cells of an individual directly contact a small cut or tear in the skin or the surface of mucous membranes in another person (Schiffman & Kjaer, 2003).
Most HPV infections are asymptomatic and do not result in any clinical disease, with 70% of infections resolving naturally within one year, and 90% clearing or becoming undetectable within two years (Dunne et al., 2006; Molano et al., 2003). Individuals with latent HPV infections may unknowingly spread the virus to others (Marhefka et al., 2012). A study of U.S. men reported 5.9 months as the median time to clearance, while a multinational study of men reported the median clearance time as 7.5 months (Giuliano et al., 2011; Lu et al., 2009). The risk for a persistent infection and development to precancerous lesions differs by HPV type. For instance, HPV 16 infections generally have a longer duration, with an average clearance time of 12.2 months (Giuliano et al., 2011). The immune system’s capacity to fight off the virus is the major deterrent to the progression of persistent HPV infection. Individuals with healthy immune systems generally clear the virus from their body before any symptoms of infection occur. In contrast, individuals with suppressed immune systems due to other diseases or conditions, including persons who are HIV positive, have higher rates of HPV acquisition, are more susceptible to persistent HPV infection, and subsequently have higher rates of HPV-associated disease (Palefsky, 2006; Denny et al., 2012).

**HPV Infection Sequelae**

Persistent HPV infection with high-risk types is linked to anal, cervical, oropharyngeal, penile, vaginal and vulvar cancers (Forman et al., 2012). Specifically, approximately 91% of cervical and anal cancers, 72% of oropharyngeal cancer, 63% of penile cancer, 75% of vaginal cancer, and 69% of vulvar cancer are attributable to HPV infection (CDC, 2014b). In the United States, the burden of HPV-associated cancers is estimated using data from the National Cancer Institute’s Surveillance, Epidemiology, and End Results (SEER) program and CDC’s National Program of Cancer Registries (NPCR) (Watson et al., 2008). Due to cancer registries generally
not including data on HPV, the number of HPV-attributable cancers is estimated by multiplying the number of cancers at each [HPV-related] anatomical site by the percentage attributable to HPV, based on previous genotyping studies (Steinau et al., 2013; Hernandez et al., 2014; Gargano et al., 2012; Hopenhayn et al., 2014; Steinau et al., 2014b, Sinno et al., 2014).

Approximately 33,160 new HPV-associated cancers were diagnosed in the United States from 2006-2010. Of those, approximately 26,900 cancers were attributable to HPV infection. Cervical and oropharyngeal cancers (10,400 and 9,000, respectively) were the most commonly diagnosed cancers, accounting for over 70% of the cancers that were attributable to HPV infection.

**Cervical precancers and cancer.** Cervical cancer is the only HPV-associated cancer with screening recommendations (Moyer, 2012; Saslow et al., 2012). Current screening recommendations include the Papanicolaou (Pap) test, an exfoliative cytological procedure that is used to assess the presence of abnormal and cancerous cells in the cervix. In appropriate clinical settings, females who are 30 years and older will receive the HPV test at the same time as the Pap test. Abnormal pap results require a follow-up, and diagnosis is determined based on the histology of the specimen, which is distinguished as either low- or high-grade squamous intraepithelial lesions (LSIL and HSIL respectively) (Darragh et al., 2012). LSIL typically resolve spontaneously and do not require treatment whereas HSIL are deemed a precursor to cancer and require treatment. Precursors of adenocarcinomas are referred to as adenocarcinoma in situ (AIS). Due to the endocervical location of AIS lesions, the Pap test does not detect them as readily (Markowitz et al., 2014). AIS is regarded as a cancer precursor that necessitates treatment.

Although the majority of AIS, HSIL, and LSIL lesions are associated with HPV, the distribution of HPV type differs by severity of the abnormality. For instance, high-risk types,
specifically HPV 16, increase in frequency with more severe lesions. A recent meta-analysis reported a HPV prevalence of 12% among women with normal cytology, and HPV 16 accounted for 20% of those cases (Guan et al., 2012). Additionally, HPV prevalence was 52% among women with unclear cytology, and HPV 16 accounted for 23% of those cases. Among women with LSIL and HSIL cytology, HPV prevalence was 75% and 85%, respectively. Results from natural history studies and molecular-level HPV analyses suggest that virtually all cervical cancers are attributable to persistent HPV infection (Forman et al., 2012). A meta-analysis of studies using PCR methods reported detection of HPV in 90% of cervical cancers globally (Li, Franceschi, Howell-Jones, Snijders, & Clifford, 2011). HPV 16 and 18 were detected in approximately 70% of cervical cancers worldwide. The prevalence of other oncogenic HPV types varied throughout the world; however, the next most frequent types detected were HPV 31, 33, 45, 52, and 58. A recent U.S. study reported that HPV was detected in 91% of cervical cancers; in particular, HPV 16 and 18 accounted for 51% and 16% of those cases, respectively (Hopenhayn et al., 2014). Other oncogenic and rare HPV types were detected in 24% of the cases.

Aside from persistent infection with high-risk HPV types, other risk factors for cervical precancer and cancer include cigarette smoking, long-term oral contraceptive use, having HIV, and higher parity (Abraham et al., 2013; International Collaboration of Epidemiological Studies of Cervical Cancer, 2007; Louie et al., 2011; Muñoz et al., 2002). While cervical cancer cases and deaths in the United States have declined considerably since the 1950s (when the Pap test was first introduced), racial/ethnic and geographic disparities in these outcomes remain prevalent (CDC, 2014d; Howlader et al., 2014). In particular, Hispanic women have the highest incidence of cervical cancer, followed by black women. Black women have the highest cervical cancer
mortality rates (Howlader et al., 2014). Furthermore, cervical cancer incidence rates and death rates are highest among the southern states compared to all other U.S. regions. Differential access to care, specifically cervical cancer screening and follow-up after receipt of an abnormal cervical cancer screening result, is considered a critical determinant of most of these disparities (Benard, Lawson, Eheman, Anderson, & Helsel, 2005).

**Vaginal and vulvar precancers and cancer.** Vaginal and vulvar cancers are rare; when combined, these cancers account for 6%–7% of all gynecologic cancers in the United States (CDC, 2012c). Most vaginal and vulvar cancers are attributable to persistent HPV infection. For instance, HPV was detected in 69% of invasive vulvar cancer and 90% of vulvar intraepithelial neoplasia grade 3 (VIN3) cases diagnosed in the United States (Gargano et al., 2012). In particular, HPV 16 was detected in 49% of invasive cancers and 81% of VIN3. The incidence of pre-invasive vulvar cancer has increased at a more rapid rate than invasive vulvar cancer since the 1970s (Kurdgelashvili et al., 2013). More recent data suggest that invasive vulvar cancer rates are increasing among black and white females (Jemal et al., 2013).

A recent U.S. study detected HPV in 75% of invasive vaginal cancer cases, and 55% of those cases detected type 16 (Sinno et al., 2014). The incidence of vaginal cancer has remained relatively constant over the last few decades. Although non-Hispanic black women have had the highest vaginal cancer rates over the last few decades, recent data indicates that the rate is decreasing within this population (Jemal et al., 2013; Kurdgelashvili et al., 2013). Beyond persistence of high-risk HPV, other risk factors for vaginal and vulvar cancer include smoking, having had cervical precancer or cervical cancer, having a condition that weakens the immune system, and having chronic vulvar itching or burning (CDC, 2012c).
**Penile cancer.** Penile cancer is an extremely rare disease. Based on data from 2004–2008, estimates indicate there are 1,048 new penile cancer cases each year in the United States, and approximately 63% of these cases are attributable to HPV (CDC, 2014a). A study conducted in the United States detected HPV in 63% of penile cancer cases (Hernandez et al., 2014). Of the penile cancers that were HPV-positive, HPV 16 (46%) was the most common type detected. Globally, HPV has been detected in 40%–50% of penile squamous cell cancers (Forman et al., 2012; Backes, Kurman, Pimenta, & Smith, 2009). When comparing these studies, differences in HPV detection are likely due to geographic differences or variations in sampling methods and testing (Markowitz et al., 2014). Invasive penile cancer rates have decreased in the United States since the 1970s, though rates were constant from 2000–2009 (Jemal et al., 2013). Beyond persistent HPV infection, risk factors for penile cancer include lack of circumcision and cigarette smoking (Daling et al., 2005).

**Oropharyngeal cancer.** Based on U.S. data from 2007–2011, the incidence of oropharyngeal cancer is 11.0 per 100,000 men and women per year (National Cancer Institute, 2014a). While tobacco and alcohol use are strongly associated with cancers of the oropharynx, there is considerable evidence to indicate a causal association between oropharyngeal cancers and oral HPV infection (Chaturvedi et al., 2011; Forman et al., 2012). In a recent U.S. study, HPV was detected in 72% of oropharyngeal cancers, and 61% had HPV 16 (Steinau et al., 2014). Within the sample, one of 14 high-risk HPV types was detected in approximately 80% of tonsillar and 70% of base of tongue cancers. Among these cancers, the prevalence of HPV 16/18 was highest among males and lowest among non-Hispanic blacks. Given that there is no established pre-invasive lesion for oropharyngeal cancer, trends for cancers of the oropharynx are restricted to invasive cancers (Markowitz et al., 2014). Oropharyngeal cancer rates have risen.
steadily among U.S. males since the 1970’s, and among U.S. females from 2000–2009 (Jemal et al, 2013; Kurdgelashvili et al., 2013). Based on current trends, it has been predicted that HPV will cause more oropharyngeal cancers than cervical cancers in the United States by 2020 (Chaturvedi et al., 2011).

**Anal precancers and cancer.** Based on U.S. data from 2007–2011, the incidence of anal cancer is 1.8 per 100,000 men and women per year (National Cancer Institute, 2014b). Although anal cancer is a rare disease, over the last 10 years incidence rates have been increasing on average 2.2% per year. Additionally, anal cancer death rates have been increasing on average 3.7% per year during 2002–2011. While anal intraepithelial neoplasia (AIN) grade 2/3 is characterized as an anal cancer precursor, the rate of progression and regression of these lesions is less clear compared to cervical lesions (Moscicki et al., 2012). A meta-analysis reported HPV was detected in 84% of anal cancers and 94% of AIN2/3 cases worldwide (De Vuyst et al., 2009). A U.S. study detected HPV in 91% of anal cancers; in particular, HPV 16 was detected in 77% of those cases (Steinau et al., 2013).

Individuals with HIV infection and men who have sex with men (MSM) are high-risk populations for anal precancer and cancer (Machalek et al., 2012; Shiels, Pfeiffer, Chaturvedi, Kreimer, & Engels, 2012; Silverberg et al., 2012). Anal cancer screening is not routinely recommended because current data are insufficient to determine whether screening is effective in preventing anal cancer and reducing associated mortality. Before routine anal cancer screening can be recommended, additional research is needed to determine the natural history of AIN, the most effective screening techniques and populations to target, as well as the safety and efficacy of treatments (CDC, 2012d; Workowski & Berman, 2011). However, some clinics conduct digital rectal exams and anal cytology to screen for AIN and anal cancer among high-risk
populations (The Regents of the University of California, 2014). Following these procedures, high-resolution anoscopy is generally recommended for individuals with abnormal cytology results. Over the last few decades, men have experienced a more rapid increase in AIN3 rates than women in the United States (Kurdgelashvili et al., 2013). This disparity could be due to actual increases in AIN3 cases or more targeted screening for MSM residing in specific areas of the country (e.g., San Francisco), which would facilitate the diagnosis (Simard et al., 2013).

Trends in short-term and long-term data indicate that invasive anal cancer has risen at a continual rate for both biological sexes and among people of nearly every racial/ethnic group (Jemal et al., 2013; Kurdgelashvili et al., 2013). Beyond persistence of high-risk HPV from sexual contact, other risk factors for anal cancer, aside from being in a high risk population, include cigarette smoking, and for females, a history of CIN, VIN, or vaginal intraepithelial neoplasia (Daling et al., 2004).

**Anogenital warts.** The most common clinical manifestation of HPV infection is anogenital warts (Scheurer, Tortolero-Luna & Adler-Storthz, 2005). Anogenital warts commonly develop on the shaft of a circumcised penis, underneath the foreskin of an uncircumcised penis, and around the vaginal opening in females (CDC, 2014e). Genital warts can also occur in the cervix, perineum, perianal skin, anal canal, urethra, scrotum, and anogenital epithelium. Worldwide, the annual incidence of anogenital warts ranged from 160.0–238.0 per 100,000, with a median of 194.5 per 100,000, and a peak incidence before 24 years of age among females and between 25 and 29 years of age among males (Patel, Wagner, Singhal, & Kothari, 2013). In the United States, anogenital warts are not routinely reported; however, based on 2004 U.S. health claims data, the annual incidence of genital warts was 1.1 per 1,000 among males and 1.2 per 1,000 among females (Hoy, Singhal, Willey & Insinga, 2009). The highest incidence of
anogenital warts occurred in females ages 20–24 and males ages 25–29 years. Genital warts are usually diagnosed through visual inspection during a clinical exam, and can be confirmed through a biopsy (CDC, 2014e).

HPV strains 6 and 11 cause approximately 90% of all genital wart lesions (Garland et al., 2009; Lacey, Lowndes & Shah, 2006). Roughly one-third of anogenital warts cases host multiple HPV strains, including co-infection with cancer-causing strains (Chan et al., 2009). Anogenital warts are highly contagious and nearly 65% of individuals who engage in sexual activity with an infected partner will acquire genital warts themselves (Lacey, 2005). The majority of anogenital warts appear 2 to 3 months after an infection with HPV, and roughly 20%–30% of anogenital warts will resolve on their own (Wiley et al., 2002; Winer et al., 2003). Approximately 30% of anogenital warts will recur, regardless of whether they clear naturally or after treatment (Chuang, Perry, Kurland, & Ilstrup, 1984). Men typically experience a longer duration of anogenital lesions, and consequently higher related costs compared to women (Dianzani et al., 2008).

Anogenital warts are linked to physical discomfort, anxiety, depression, as well as negative impacts on interpersonal relationships (Anic & Giuliano, 2011; Dominiak-Felden et al., 2013; Pirotta et al., 2009; Woodhall et al., 2011).

**Recurrent respiratory papillomatosis.** RRP is a rare condition that is caused by low-risk HPV types, mainly types 6 or 11 (Venkatesan, Pine, & Underbrink, 2012). RRP is characterized by recurrent papillomas or wart-like growths in the upper respiratory tract, with the larynx being the most common site of infection (Derkay & Wiatrak, 2008). These warts can cause hoarseness, chronic coughing, and difficulties with sleeping, swallowing, and breathing. RRP is categorized as juvenile onset (JORRP) or adult onset, and distinctions are based on age at presentation of wart-like growths. JORRP is defined as onset before 18 years of age, with a
median age of diagnosis at 3.2 years (Hawkes et al., 2008). It is widely accepted that JORRP results from vertical transmission of HPV from mother to infant during delivery. Adult-onset RRP is acquired through transmission of HPV during sexual contact. The incidence of JORRP is approximately 4.3 per 100,000 for children under 18 years of age (U.S. Department of Health & Human Services, USDHHS, National Institute of Health, NIH, National Institute on Deafness and Other Communication Disorders, NIDCD, 2010). JORRP is associated with extensive complications, as it requires a median of 4.3 annual surgeries to remove warts and maintain an open upper respiratory tract (Reeves et al., 2003). Among adults, the incidence of RRP is approximately 1.8 per 100,000 (USDHHS, NIH, & NIDCD, 2010).

**HPV Risk Factors**

Epidemiologic investigations have found strong associations between number of recent sexual partners, number of lifetime sexual partners, sexual frequency, age at sexual debut, condom use, and HPV infection (Baseman & Koutsky, 2005; Dunne et al., 2006; Lu et al., 2009; Nielson et al., 2007). Other factors associated with HPV infection include educational level, circumcision, race, ethnicity, condom use, age, cigarette smoking status, and oral contraceptive use (Baldwin et al., 2004; Lu et al., 2009; Nielson et al., 2007; Nielson et al., 2010; Winer et al., 2003).

**Economic and Psychosocial Burden of HPV**

Approximately $8 billion is spent annually on direct medical costs associated with secondary prevention and treatment of HPV (Chesson et al., 2012). This estimate does not include HPV vaccination or other primary prevention HPV programs. An estimated $1 billion is used to treat cancer, with $300 million for oropharyngeal cancer and $400 million for invasive cervical cancer. Roughly $300 million is spent on the treatment of anogenital warts and $200
million for the treatment of RRP, with the remainder ($6.6 billion) spent on cervical cancer screening and follow-up. In addition to the economic burden of HPV, there are several negative psychosocial outcomes associated with a positive HPV diagnosis. Individuals who are HPV positive often experience stress, anxiety, depression, as well as negative impacts on interpersonal relationships (Anic & Giuliano, 2011; Daley et al., 2010b; Dominiak-Felden et al., 2013; McCaffery, Waller, Nazroo, & Wardle, 2006; Pirotta et al., 2009; Woodhall et al., 2011). One cross-sectional study reported that HPV-positive men were significantly more likely to report being angry, frustrated, confused, guilty, scared, concerned/worried, shocked and depressed when they received their test result compared to HPV-negative men (Daley et al., 2012).

Prevention of HPV Infection

Abstinence from anogenital contact with another person is the most effective method to prevent HPV infection (Markowitz et al., 2014). Individuals can reduce their probability of contracting HPV by limiting their number of sexual partners, selecting partners who have had few or no previous sexual partners, and being in a monogamous relationship with one partner. Male condoms may reduce the risk of HPV infection when they are utilized correctly and consistently (Centers for Disease Control and Prevention, CDC, 2013a; Nielson et al., 2010). However, the male condom does not provide full protection from HPV because the virus can infect areas that are not covered by the condom. One prospective study among sexually active college women reported a 70% lower incidence of HPV infection when their sexual partners used condoms correctly and consistently (Winer et al., 2006). Based on results from randomized clinical trials, male circumcision lowers the risk of HPV infection among circumcised males and their female sexual partners (Auvert et al., 2009; Gray, Wawer, Serwadda, & Kigozi, 2009; Tobian et al., 2009; Tobian, Gray, & Quinn, 2010). Routine surveillance for HPV and partner
notification are not effective strategies for HPV prevention because the virus is prevalent and most sexually active people will acquire one or more strains at some point in their lifetime (CDC, 2014a). Aside from abstinence, which is not feasible for most people, HPV vaccination is positioned as the most effective strategy for the prevention of HPV. HPV vaccination will be discussed in detail in the next section.

**HPV Vaccines**

**HPV vaccine recommendations.** In June 2006, the United States Food and Drug Administration approved Gardasil®, the quadrivalent HPV vaccine (4vHPV), to protect females ages 9 to 26 from anogenital warts, precancerous lesions, and anogenital cancer caused by four (types 6, 11, 16, and 18) of the most burdensome strains of HPV (U.S. Food and Drug Administration, 2006). In October of 2009, the FDA approved Gardasil® to prevent genital warts among males 9 to 26 years of age; the quadrivalent vaccine was also approved to prevent anal cancer and precancerous lesions among males and females ages 9 to 26 (U.S. Food and Drug Administration, 2009b; U.S. Food and Drug Administration, 2010). Cervarix®, the bivalent HPV vaccine (2vHPV) that protects against two cancer-causing HPV strains (types 16 and 18), was approved for use among females ages 9 to 26 was also approved in October of 2009 (U.S. Food and Drug Administration, 2009a). In December of 2014, the FDA approved Gardasil®9, the nine-valent HPV vaccine (9vHPV), to protect females ages 9 to 26 and males ages 9 to 15 from nine HPV types (6, 11, 16, 18, 31, 33, 45, 52, and 58) responsible for anogenital warts and anal, cervical, vaginal, and vulvar precancers and cancers (U.S. Food and Drug Administration, 2014a).

The Advisory Committee on Immunization Practices (ACIP) is a federal advisory committee, which provides expert advice and recommendations to the CDC Director about the
use of vaccines for disease control and prevention in the U.S. population (Markowitz et al., 2014; Petrosky et al., 2015). The bivalent, quadrivalent, and nine-valent vaccines are all likely effective for prevention of oropharyngeal cancer caused by HPV, but data from clinical trials are not currently available (Herrero et al., 2013; Steinau et al., 2014). The ACIP recommends routine HPV vaccination with one of the FDA-approved vaccines with the 3-dose series for females (2vHPV, 4vHPV, 9vHPV) and males (4vHPV or 9vHPV) ages 11 or 12. Vaccination with 2vHPV, 4vHPV, or 9vHPV is recommended for females 13 through 26 years of age who have not been vaccinated previously or who have not completed the HPV vaccine series (Markowitz et al., 2014; Petrosky et al., 2015). For males who have not been vaccinated previously or who have not completed the HPV vaccine series, vaccination is recommended for males 13 through 21 years of age. Specifically, the 4vHPV is recommended for males 11 to 21 years of age, though males between the ages of 22 and 26 may also be vaccinated with 4vHPV. The ACIP recommends that men with compromised immune systems and men who have sex with other men (MSM) through age 26 should receive the 4vHPV vaccine if not previously vaccinated (Petrosky et al., 2015). The 9vHPV is only recommended for males between the ages of 11 and 15 years. A summary of the HPV vaccines as well as ACIP vaccine-specific recommendations is provided in Table 1.1.

In the United States, the series is recommended for delivery on a schedule of 0, 1–2, and 6 months (CDC, 2015a; Markowitz et al., 2014). Specifically, the second dose should be administered 1 to 2 months after the first dose, with a minimum interval of 4 weeks between doses. The third dose may should be administered no sooner than 24 weeks after the first dose and 16 weeks after the second dose. These dosage and scheduling recommendations are based on clinical trials that evaluated the efficacy of 2vHPV and 4vHPV in producing immunogenicity,
and prevention of HPV-associated disease and persistent infection (Giuliano et al., 2011b; Muñoz et al., 2010). However, research indicates that the efficacy and immunogenicity produced by the HPV vaccine administered over 12 months is non-inferior to the standard 6-month schedule (LaMontagne, Thiem, Huong, Tang, & Neuzil, 2013; Lin, Zimmerman, Nowalk, Huang, & Raviotta, 2014; Zimmerman et al., 2010). A clinical trial is currently ongoing to evaluate an alternative dosing schedule of 9vHPV; the results will be formally reviewed by ACIP as data becomes available (Petrosky et al., 2015).

Currently, the most commonly administered HPV vaccine in the United States is 4vHPV, accounting for 99% of HPV vaccine doses administered since 2006 (Stokley et al., 2014). Primary care providers or health clinics deliver nearly all HPV vaccinations (Dorell, Yankey, Santibanez, & Markowitz, 2011). There is public and private funding for HPV vaccines in the United States. The Vaccines for Children Program provides enrolled public and private health care providers with federally funded vaccines for use among children younger than 19 years of age who are uninsured, underinsured, Medicaid-eligible, or American Indian or Alaska Native (CDC, 2014f). The Patient Protection and Affordable Care Act (2010) requires non-grandfathered private health plans to offer vaccines that are recommended by ACIP at no cost to beneficiaries. Qualified health plans that are offered through the health insurance exchanges are also required to offer ACIP-recommended vaccines at no cost to beneficiaries. For adults without health insurance, the 4vHPV vaccine costs $147.01 per dose for a total of $441.03 for the vaccine series, not including additional costs for vaccine administration, the primary care provider’s charge, or related taxes (CDC, 2015b).

**Rationale for HPV vaccine recommendations.** HPV vaccines are most effective when received prior to exposure to HPV (Kjaer et al., 2009; Lehtinen et al., 2012; Schiller,
Castellsagué, & Garland, 2012). The routine recommendation for HPV vaccination at age 11 or 12 years is based on several factors. Studies have found that HPV vaccines are safe and immunogenic among this age group, and higher antibody titers are reported after vaccination among 11 or 12 year olds compared with individuals in older age groups (Block et al., 2006; Joura et al., 2015; Pedersen et al., 2007). Age of sexual debut in the United States, cost-effectiveness models, and data on HPV epidemiology were also considerations for current recommendations (Brisson, de Velde, & Boily, 2009; Canfell et al., 2012; Chandra, Mosher, Copen, & Sionean, 2011; Chesson, 2015). Additionally, several professional organizations recommend young adolescent health care visits at age 11 or 12, which is seen as a prime opportunity for receipt of several routine vaccines, including the HPV vaccine (CDC, 2015c). Current data indicate that vaccination provides long-term protection from HPV, but longitudinal follow-up investigations are being conducted to evaluate the duration of its protection (Naud et al., 2014).

HPV vaccination can benefit older adolescents and young adults through the ACIP-recommended ages. Adolescents and young adults who have not engaged in sexual activity can receive the maximum benefit of vaccination. For sexually active individuals in this group who have been infected with one or more HPV types, the vaccine can provide protection against types they have not acquired. Studies have found that only a small proportion of sexually active adolescents and young adults have been infected with HPV 16 and 18, or all vaccine-preventable types (Barr et al., 2008; Markowitz et al., 2009). Although the HPV vaccine is less effective when received by persons who are sexually active and older in age (which increases the risk of having already been exposed to HPV), the majority of persons in the recommended age range receive at least partial benefit from vaccination (Markowitz et al., 2014).
**Vaccine safety.** In the United States, federal agencies and vaccine manufacturers conduct post-licensure vaccine safety monitoring and evaluation independently. An estimated 67.5 million doses of 4vHPV have been distributed between June 2006 and March 2014 (Stokley et al., 2014). Provided 4vHPV accounted for a major proportion (99%) of the doses distributed within the United States during this period, vaccine safety data was limited to 4vHPV. The Vaccine Adverse Event Reporting System (VAERS) received a total of 25,063 adverse event reports from individuals who had received 4vHPV; of those, 22,867 adverse events occurred in females and 2,196 in males. Adverse events are “undesirable experiences occurring after immunization that may or may not be related to the vaccine” (CDC, 2013b, para. 6). Adverse event reports peaked in 2008, and declined each year thereafter (CDC, 2013c). The proportion of adverse event reports to VAERS that were classified as serious (e.g., those resulting in hospitalization, permanent disability, life-threatening illnesses, or death) peaked in 2009 (12.8%) and decreased substantially by 2013 (7.4%), which was the last full year of reporting. Approximately 92.4% of the reports were classified as non-serious. Of those, the most frequently reported generalized symptoms experienced by females included syncope (fainting), dizziness, headache, nausea, vomiting, and fever. Among males, the most commonly reported generalized symptoms were syncope, dizziness, pallor, and loss of consciousness. For both biological sexes, the most commonly reported local symptoms were pain and redness at the injection site. Among the reports that were categorized as serious (7.6%), headache, nausea, vomiting, and fever were the most commonly reported symptoms among both males and females (Markowitz et al., 2014). Reporting of adverse events to VAERS has been consistent with pre-licensure data from clinical trials and the 2009 summary of the initial 2.5 years of post-licensure reporting to VAERS (Slade et al., 2009; Stokley et al., 2014). The VAERS received 96 reports of death after 4vHPV during
the post-licensure period between June 2006 and March 2014 (CDC, 2015b). The CDC and FDA review all information that is available following receipt of any vaccine, including 4vHPV. Of the 96 reports of death during this period, 47 deaths were confirmed based on an autopsy report, certificate of death, or other medical documentation of death that was submitted with the report. Among the confirmed death reports, causes of death included bacterial meningitis, viral myocarditis, seizure disorder, pulmonary embolism, and diabetic ketoacidosis. CDC and FDA medical officers conducted a thorough review of each death report following receipt of 4vHPV solely or in combination with other vaccines, and were unable to identify any pattern of occurrence of death related to time after vaccination, dose number, combination of vaccines administered, or diagnosis at death to suggest a causal association between 4vHPV and death.

The Vaccine Safety Datalink (VSD) is a collective project of the CDC’s Immunization Safety Office and nine health care organizations, and is responsible for conducting evaluations of adverse events that may be associated with vaccination (Gee et al., 2011). The VSD analyzed data after 600,558 doses of 4vHPV were administered to females. There were no statistically significant increased risks observed for Guillain-Barré syndrome, stroke, appendicitis, seizures, syncope, venous thromboembolism, allergic reactions, or anaphylaxis. Studies with males are in process. The 4vHPV and 9vHPV manufacturer, Merck, has also conducted post-licensure studies (Klein et al., 2012; Chao et al., 2012). A safety assessment evaluating medical outcomes diagnosed in emergency department visits and hospitalizations among females who received at least 1 dose of 4vHPV, identified same-day syncope and skin infections 2 weeks after vaccination to be associated with 4vHPV. However, no other safety issues were found (Klein et al., 2012). Another study reported that rates of 16 autoimmune disorders within the vaccinated population were not higher than a matched population of nonvaccinated females (Chao et al.,
Post-licensure data from other countries also indicates that the 4vHPV vaccine is safe (Arnheim-Dahlstrom, Pasternak, Svanstrom, Sparen, & Hviid, 2013; Grimaldi-Bensouda et al., 2014; Macartney, Chiu, Georgousakis, & Brotherton, 2013). The safety of 9vHPV has been evaluated in approximately 15,000 subjects, and has a safety profile comparable to 4vHPV (Joura et al., 2015; Petrosky et al., 2015).

**Vaccine contraindications and precautions.** The HPV vaccines are contraindicated for individuals with a history of allergy or sensitivity to any component of the vaccine, or to a previous dose of the vaccine (CDC, 2011; CDC, 2013d; Petrosky et al., 2015). Prefilled syringes of 2vHPV may have a tip cap that contains latex; therefore, it should not be used in persons with an anaphylactic allergy to latex. Viral proteins used in 4vHPV and 9vHPV are manufactured in *Saccharomyces cerevisiae*, which is baker’s yeast; consequently, 4vHPV and 9vHPV are contraindicated for any person with an allergy or immediate hypersensitivity to yeast. The HPV vaccines are not recommended for pregnant women. While the vaccines have not been causally associated with adverse outcomes related to pregnancy or in the fetus, women who find out they are pregnant after receiving one or more doses should delay the remaining doses until the pregnancy is completed (Markowitz et al., 2014; Petrosky et al., 2015). However, no intervention is necessary if a dose has been administered during pregnancy. Women who are breastfeeding may receive the vaccine. Persons with minor acute illnesses such as a mild upper respiratory tract infection or diarrhea (with or without fever) may also receive the vaccination. However, persons with a moderate or severe acute illness should not get vaccinated until they are better. Although syncope after 4vHPV is uncommon, it is still one of the most frequently reported adverse events to VAERS (CDC, 2013c). The ACIP recommends for vaccine administrators to observe patients for 15 minutes after they receive any vaccine, including the HPV vaccine (Kroger, Sumaya,
Pickering, & Atkinson, 2011). Specifically, patients should be seated or lying down during this period to reduce the risk for injury in the event they should faint.

**Vaccine coverage.** Based on data from the 2013 National Immunization Survey–Teen, among adolescents ages 13 to 17, HPV vaccine coverage for \( \geq 1 \) dose has increased an average of 4.5% for females from 2007–2013, and 9.9% for males from 2010–2013 (Elam-Evans et al., 2014). During 2013, \( \geq 1 \) HPV dose coverage was statistically significantly higher among females aged 15 to 17, compared with females 13 to 14 years of age. However, among males ages 13 to 17, \( \geq 1 \) dose coverage did not differ by age. Females between ages 13 and 17 had greater vaccine coverage than males for \( \geq 1, \geq 2, \) and 3-dose HPV series completion. While increases in HPV vaccine coverage were observed for both biological sexes in 2013, only 34.6% of males ages 13 to 17 had received \( \geq 1 \) dose of the HPV vaccine, and only 13.9% had completed the 3-dose vaccine series (Stokley et al., 2014). Comparatively, 57.3% of females in this age group had received \( \geq 1 \), and 37.6% had completed the 3-dose series. For females, \( \geq 1, \geq 2, \geq 3 \) HPV dose coverage was higher for Hispanic than white adolescents. Black females had lower HPV series completion than white adolescents. Among males, \( \geq 1, \geq 2, \geq 3 \) HPV dose coverage was higher for Hispanic and black adolescents than white adolescents. No statistically significant racial or ethnic differences in HPV series completion were identified for males. HPV series completion did not differ by poverty level for adolescent males or females in 2013. However, male adolescents living below the poverty level had higher \( \geq 1, \geq 2, \geq 3 \) HPV dose coverage, and female adolescents had higher \( \geq 1 \) and \( \geq 2 \) dose coverage, when compared with those living at or above the poverty level.

The CDC analyzed data from the 2012 National Health Interview Survey to assess HPV vaccination coverage among adults aged \( \geq 19 \) years (Williams et al., 2014). Estimates indicate
that as few as 2.3% of males 19 to 26 years of age had received ≥ 1 doses of HPV vaccine, compared to 34.5% of females in the same age group. HPV vaccine coverage was 2.4% for males 19 to 21 years of age versus 44.3% among females in this age group. Receipt of ≥ 1 dose of HPV vaccine was 2.2% among males 22 to 26 years of age, and 28.2% among females in this age group.

The American College Health Association’s Spring 2014 National College Health Assessment (NCHA) II reported that only 29% of college males had received the HPV vaccine, compared to 59% of their female counterparts (ACHA, 2014). One important note is that the NCHA II survey did not ask respondents how many doses of HPV vaccine they had received; therefore, it is impossible to determine HPV vaccination coverage by dose. Consequently, the results may be inflated because the question is based on the assumption that respondents know the HPV vaccine consists of three doses, and that respondents have completed the series if they select “yes” as their response. Overall, the available data indicate that HPV vaccine uptake and series completion rates are low for both biological sexes, but vaccination coverage rates for males lag behind those for females considerably. This disparity is concerning yet logical given that the first HPV vaccine became available for females in 2006, but not until late 2009 for males.

**HPV vaccination impact.** Since most cancers that could be prevented through HPV vaccination develop several years after HPV infection, it may take decades before the impact of the 2vHPV, 4vHPV, or 9vHPV is evident for HPV-associated cancer outcomes (Markowitz et al., 2014). Currently, the United States has cancer registries that monitor the incidence of HPV-associated cancers (Watson et al., 2008). More immediate outcomes are also being monitored and evaluated to determine the impact of HPV vaccination, including HPV prevalence, genital
warts, and cervical precancers (Powell et al., 2012; Hariri et al., 2012; Wheeler et al., 2013; Markowitz et al., 2013; Flagg, Schwartz, & Weinstock, 2013).

Although the 3-dose HPV vaccine coverage in 2010 was only 32% among U.S. females 13 to 17 years of age, data that was collected within four years of HPV vaccine introduction revealed a decline in the HPV vaccine type prevalence and genital warts among adolescent females (CDC, 2013c). A national study found that the prevalence of HPV 6, 11, 16, and 18 among U.S. adolescent females ages 14 to 19 years declined from 11.5% during 2003–2006 to 5.1% during 2007–2010 (Markowitz et al., 2013). Based on an ecologic analysis of U.S. private health insurance claims data, genital wart prevalence among females aged 15 to 19 years decreased from 2.9 per 1,000 person-years in 2006 to 1.8 cases per 1,000 person-years in 2010, amounting to a 38% reduction in genital warts claims within this group (Flagg et al., 2013). Other studies conducted in the United States have also provided evidence that the vaccine has reduced vaccine-type HPV prevalence (Kahn et al., 2012; Cummings et al., 2012).

There have been significant decreases in vaccine-type prevalence and genital warts in countries with high HPV vaccination coverage, such as Australia, New Zealand, and Denmark (Ali et al., 2013a; 2013c; Baandrup et al., 2013; Hariri, Markowitz, Dunne, & Unger, 2013; Oliphant & Perkins, 2011). For instance, Australia implemented one of the first nationally funded 4vHPV vaccination programs for girls and young women in 2007 (Garland, Skinner, & Brotherton, 2011). The ongoing program offers free HPV vaccination to females 12 to 13 years of age in Australian schools. Furthermore, during 2007–2009, two catch-up programs were initiated; one is intended for female students ages 13 to 18 years in schools, and the other program is for 18 to 26 year old females within the community. After three years of the national program, vaccination coverage rates for the school-based program were 83% for the first dose,
80% for the second dose, and 73% for the third dose among 12 to 13 year old females (Gertig, Brotherton, & Saville, 2011). Since the program began, new cases of genital warts declined 73% among vaccine eligible females in STI clinics throughout Australia (Garland et al., 2011).

Genital wart diagnoses in Australia decreased from 11.5% in 2007 to 0.85% in 2011 ($p < .001$) among females under 21 years of age and from 11.3% in 2007 to 3.1% in 2011 ($p < .001$) among females ages 21 to 30 (Ali et al., 2013a). This study also reported an 82% decline in genital warts among heterosexual males, despite not being vaccinated, a finding that was attributed to herd immunity. In July 2012, Australia’s national 4vHPV immunization program was extended to males 12 to 13 years of age, with a two-year catch-up program for males in the ninth year of school (e.g., males ages 14 to 15 years) (Wilkinson, 2012). The national program did not go into effect for males until February 2013; consequently, studies that monitor and evaluate the impact of male vaccination on HPV incidence and genital warts have not been published yet (Brill, 2013).

**Treatment**

Although HPV infections are not treated, HPV-associated lesions such as RRP, anogenital warts, precancers, and cancers may be treated (Massad et al., 2012; National Cancer Institute, 2014c; Workowski & Berman, 2011). However, treatments differ depending on the individual’s diagnosis, as well as the size and location of the lesion (Markowitz et al., 2014). Local treatment may not eliminate all cells that contain HPV entirely and it is ambiguous whether these treatments decrease infectiousness.
Public Health Interventions Targeting HPV Vaccination

HPV vaccination settings.

Primary care. In the United States, primary care providers (PCPs) deliver a large proportion of HPV vaccinations (Dorell et al., 2011; Markowitz et al., 2014). Primary care is generally provided in an outpatient setting by a medical doctor (U.S. National Library of Medicine, 2013). However, there are several different types of PCPs, including family practitioners, pediatricians, internists, obstetricians/gynecologists, nurse practitioners, or physician assistants. The American Academy of Family Physicians (AAFP, 2014) and American Academy of Pediatrics (AAP, 2002) recommend that all adolescents receive primary care, including vaccinations, within a medical home. The American College of Physicians (ACP, 2014) defines the Patient Centered Medical Home as a “care delivery model whereby patient treatment is coordinated their primary care physician to ensure they receive the necessary care when and where they need it, in a manner they can understand” (para. 1). Medical homes are considered the optimal venue for HPV vaccine administration, specifically the first dose, because they provide opportunities to concomitantly educate patients and provide other preventive care services (National Cancer Institute [NCI], 2014d).

Parents and adolescent males are most comfortable with receiving the HPV vaccine at a doctor’s office, compared to a public clinic, school, or a pharmacy (Reiter, McRee, Pepper, Chantala, & Brewer, 2012). Further, a PCP’s recommendation for HPV vaccination is the strongest predictor of HPV vaccination among adolescents and young adults (Dorell et al., 2011; Gargano et al., 2013; Lau, Lin, & Flores, 2012; Ratanasiripong, Cheng, & Enriquez, 2013; Reiter et al., 2013; Rosenthal et al., 2011; Ylitalo, Lee, & Mehta, 2013). Consequently, many esteemed organizations and agencies such as the National Cancer Institute, AAFP, AAP, ACP, CDC,
American College of Obstetricians and Gynecologists (ACOG), and Immunization Action Coalition have requested that physicians recommend the HPV vaccine to patients in an effort to increase HPV vaccine uptake (AAFP et al., n.d.; NCI, 2014d). Several interventions have been conducted in primary care settings (Fiks et al., 2013; Kharbanda et al., 2011; Matheson, Derouin, Gagliano, Thompson, & Blood-Siegfriend, 2014).

**Health clinics.** Health clinics also deliver a large proportion of HPV vaccines in the United States (Markowitz et al., 2014). Health clinics include but are not limited to local health departments, emergency departments, teen clinics, gynecologic/reproductive health centers, college/university health centers, and other specialty clinics. Many targeted HPV vaccination interventions and programs have been implemented in community-based health clinics and reproductive health centers (i.e., Planned Parenthood) (Patel et al., 2012, 2014; Vanderpool et al., 2013).

**Schools and school-based health centers.** Although the majority of the HPV vaccinations are delivered in primary care or health clinic settings, some schools, including school-based health centers, stock and deliver the HPV vaccine. At present, only 21 states and the District of Columbia (DC) have laws that provide financial assistance to cover the cost of the vaccines, support HPV and HPV vaccination education, or require HPV vaccination for school entry (National Conference of State Legislatures, 2014). For example, DC and Virginia require the vaccine for females to enter the sixth grade; however, parents have the ability to opt out of the requirement for medical, moral, or religious reasons. School vaccination requirements are primarily determined by state legislatures. A few state legislatures have given regulatory bodies such as state health departments the ability to require vaccines; however, these agencies depend on the legislature for funding. School-based vaccination programs have had considerable success.
both nationally and internationally (Kessels et al., 2012; Moss et al., 2014; Paul & Fabio, 2014). HPV vaccine series completion is highest when delivered in schools compared to other settings (Brotherton, Gertig, Chappell, Rowlands, & Saville, 2011; Gertig et al., 2011; Tan et al., 2011). However, there are major financial, political, and logistical barriers to school-based vaccination programs. One study of North Carolina-based school health centers that stocked HPV vaccine reported several barriers to providing HPV vaccination: (a) students not returning parental consent forms (76%), (b) difficulty using the North Carolina Immunization Registry (NCIR) (i.e., slow operating systems, effort required for double-data entry for NCIR and internal records, and need for additional training to use Registry) (76%), (c) costs to order and stock privately purchased HPV vaccine (67%), (d) obtaining students’ immunization history (61%), and (e) inadequate reimbursement from insurance companies for administering privately purchased HPV vaccine (42%) (Moss et al., 2014).

**Pharmacies.** Pharmacies have been posited as one of the most viable alternative settings for the delivery of HPV vaccination due to their high accessibility for most people (McRee, Reiter, Pepper & Brewer, 2013; Shah, Gilkey, Pepper, Gottlieb, & Brewer, 2013). Pharmacists are the most prevalent healthcare providers in rural and health professional shortage areas, positioning pharmacies as a logical alternative venue for HPV vaccination delivery (Knapp, Paavola, Maine, Sorofman, & Politzer, 1999). There are many benefits of pharmacies, including availability of services without appointments, extended hours (e.g., evenings and weekends), and the ability to perform claims adjudication at the time of the visit (Grabenstein, 1998). Many pharmacies offer the HPV vaccine, but the stipulations under which pharmacists have the authority to administer the vaccine varies considerably in each state. For example, pharmacists in approximately 41%, 39%, and 20% of states do not have the authority to administer the HPV
vaccine to individuals ages 9, 12, or 19 or older, respectively (Brewer, Chung, Baker, Rothholz, & Smith, 2014). Further, pharmacists may administer the HPV vaccine to a 12 year-old female in 6% of states without prior approval from a prescriber, in 31% of states under some type of protocol with a prescriber, and in 24% of states with a prescription from a prescriber. Moreover, pharmacists may administer the HPV vaccine to females ages 19 years and over in 10% of states without prior approval from a prescriber, in 53% of states under some type of protocol with a prescriber (e.g., a signed supervision agreement with a prescriber that allows pharmacists to administer the vaccine to patients regardless of their PCP or a supervision agreement limited exclusively to patients of the prescriber who signed the agreement), and in 18% of states with an HPV vaccine prescription from a prescriber. At this time, there are no published studies of pharmacy-based interventions or programs to increase HPV vaccination.

**Priority populations.** Cervical cancer is the most common cause of death associated with persistent HPV infection; therefore, it is comprehensible that the majority of prevention efforts and research has focused on females (Dunne et al., 2006). For instance, the first HPV vaccine was licensed for use in females in 2006, but vaccine approval for males did not occur until late 2009. A vaccine exclusively licensed for females initially may have contributed to HPV being incorrectly labeled as a woman’s disease (Allen, Fantasia, Fontenot, Flaherty, & Santana, 2009). However, HPV infection negatively impacts both males and females; therefore, vaccinating both biological sexes is necessary to reduce the overall HPV burden (Fontenot & Morelock, 2012; Stupiansky, Alexander, & Zimet, 2012). Most HPV research has targeted adolescents or parents of vaccine-eligible children because the vaccine is most effective when received during this development period, typically before sexual contact (Cummings et al., 2012; Shah et al., 2014; Reiter et al., 2012, 2013). However, college age students who are at high risk
for HPV infection and eligible for the vaccine also reap protective benefits from vaccination, and should be included in HPV vaccination research (Markowitz et al., 2014; Partridge et al., 2007; Satterwhite et al., 2013; Winer et al., 2003). The following sections discuss the burden of HPV for males and college students, both populations that are often overlooked in HPV prevention and HPV vaccination research.

**HPV, males, and risk behavior.** HPV infection among males is a salient public health issue because of its high prevalence, increasing disease burden in this population, as well as its high risk of transmission to females during heterosexual encounters (Dunne et al., 2006; Palefsky, 2010; Stupiansky et al., 2012). HPV is vastly prevalent among males; a large cohort study of men aged 18-70 residing in Brazil, Mexico, and the United States reported a 50% prevalence of HPV infection, with a 30% prevalence of oncogenic types, and a 38% prevalence of nononcogenic types at baseline (Giuliano et al., 2011a). HPV infection is associated with significant morbidity in males, including anal, oropharyngeal, and penile cancers, as well as genital warts and RRP. Oropharyngeal cancer is the most common HPV-associated cancer among U.S. males, and oral cancer rates have risen steadily among males since the 1970’s (Jemal et al, 2013; Kurdgelashvili et al., 2013). Approximately 80% of all oropharyngeal cancers occur in males (CDC, 2014b). Based on current trends, HPV is projected to cause more oropharyngeal cancers than cervical cancers in the United States by 2020 (Chaturvedi et al., 2011).

Immunosuppressed males, including those with HIV infection, and MSM are high-risk populations for anogenital warts, AIN, and anal cancer (Machalek et al., 2012; Shiel et al., 2012; Silverberg et al., 2012). Although anogenital warts are benign and not life threatening, they can cause pain, itching, and bleeding (Wiley et al., 2002). In addition to poor physical outcomes, HPV infection is also associated with negative psychosocial outcomes for males. A cross-
sectional study found that HPV-positive men were significantly more likely to report being angry, frustrated, confused, guilty, scared, concerned/worried, shocked and depressed when they received their test result compared to HPV-negative men (Daley et al., 2012). Another cross-sectional study found that genital warts were a source of psychosocial distress, linked to internalized shame and intrusive thoughts (Jeynes, Chung, & Challenor, 2009).

Males are at high-risk for acquiring and transmitting HPV infection due to their engagement in risky sexual behavior, including sex with multiple sexual partners and unprotected sex. Results from the 2013 Youth Risk Behavior Risk Surveillance System found that 16.8% of high-school males reported having had sexual intercourse with four or more persons during their lifetime, compared to 13.2% of females, and this difference was statistically significant ($p < .00$) (CDC, n.d.). Males between the ages of 30 and 44 years report an average of 6–8 female sexual partners in their lifetime, compared to an average of 4 male sexual partners among females in the same age group (Mosher, Chandra, & Jones, 2005). In a recent national study, 12.5% of college males reported having four or more sex (e.g., oral sex, anal or vaginal intercourse) partners within the last 12 months, compared to 8.7% of their female counterparts (ACHA, 2014). Within this sample, only 5.1% of male students who had oral sex in the last 30 days reported using a condom or other protective barrier mostly or always during oral sex within the last 30 days. Furthermore, slightly over half (54.4%) and approximately one third (34.8%) of college males reported using a condom or other protective barrier mostly or always during vaginal and anal intercourse in the last 30 days, respectively. Approximately one third (34.2%) of high school males who were currently sexually active reported not using a condom during last sexual intercourse (CDC, n.d.).
Males also engage in binge drinking which may impair their sexual decision-making, putting them at high risk to engage in unprotected sex (Nolen-Hoeksema, 2004). For example, high school males (25.92%) who were currently sexually active were statistically significantly more likely to report that they drank alcohol or used drugs before last intercourse compared to their female (19.27%) counterparts ($p < .00$). A national study found that 22.3% of male college students who drank alcohol reported having had unprotected sex in the last 12 months when drinking alcohol (ACHA, 2014).

Given that there are no HPV tests approved or recommended for use in males and HPV infection is often asymptomatic, males are unlikely to know they are infected (Markowitz et al., 2014). Consequently, males are at high risk for unknowingly spreading the virus to sexual partners (Marhefka et al., 2012).

**HPV, college students, and risk behavior.** College is marked as a time of sexual experimentation, which places many college students at high risk for sexually transmitted infections (STI), including HPV (Jones & Cook, 2008; Furman & Shaffer, 2011; Reiber & Garcia, 2010; Staggers, Brann, & Maki, 2012). Specifically, college students engage in risky sexual behaviors that increase their likelihood of acquiring STI, including unprotected sex, serial monogamy, multiple sexual partners, and combining alcohol and/or other drugs during sexual encounters (Lewis, Miguez-Burbano, & Malow, 2009). Traditional college-age students (e.g., 18 to 24 years) are an important population to target with regards to HPV vaccination research and promotion because they are at high risk for HPV infection and are eligible for the HPV vaccine (Partridge et al., 2007). HPV infections accounted for approximately 72% of all existing STI and 71% of all newly acquired STI in 2008 (Satterwhite et al., 2013). Within this sample, HPV infection prevalence rates were highest among men ages 15 to 24 years old. More specifically,
the highest prevalence of HPV infection occurred in 20 to 24 year-olds: 53.8%, 95% CI [45.9, 61.5]. Furthermore, approximately half of all new HPV infections occur among 15 to 24 year old persons, including students of traditional college age. A cohort study of heterosexually active males between the ages of 18–20 attending a university in the United States reported a 62.4% cumulative incidence of HPV infection of any type at 24 months (Partridge et al., 2007). In contrast, a prospective study of females attending a university in the United States reported a cumulative probability of incident HPV infection of 38.9% at 24 months after their initial sexual intercourse (Winer et al., 2003). Although the HPV vaccine is less effective when received by persons who are sexually active and older in age (which increases the risk of having already been exposed to HPV), the majority of persons in the recommended age range will receive at least partial benefit from vaccination (Markowitz et al., 2014). Despite this, many college students (males in particular) remain unvaccinated (ACHA, 2014). To illustrate, a recent national study found that more than two thirds (71%) of college males reported that they had not received the HPV vaccine or did not know if they had been vaccinated (ACHA, 2014). In light of college males’ high risk for acquiring HPV and low vaccination rates, there is a need to include this subpopulation in HPV vaccination research and promotion efforts. Unfortunately, traditional college age males have largely been overlooked in HPV vaccination research and rarely targeted within interventions.

**Intervention frameworks.** Few HPV vaccination interventions to increase HPV vaccine uptake and series completion have been conducted; of those, the majority have been school or clinic-based programs interventions implemented as part of a national vaccination program in countries other than the United States (Ali et al., 2013a, 2013b; Brotherton et al., 2011; Gertig et al., 2011; Hilton, Hunt, Langan, Bedford, & Petticrew, 2010; Tan et al., 2011). Among HPV
vaccination interventions that have been evaluated and published in peer-reviewed literature, the majority targeted pre-adolescents or adolescents, or parents of vaccine-eligible individuals. Few HPV vaccination interventions have targeted young adults, particularly males. This section will provide an overview of HPV vaccine interventions that have employed non-theoretical or theoretical frameworks.

**Non-theory based interventions.** Fu, Bonhomme, Cooper, Joseph, and Zimet (2014) conducted a systematic review of educational interventions to increase HPV vaccination acceptance in persons eligible to receive the vaccine, or their parents. The following outcome measures were evaluated: (a) receipt of HPV vaccine (any dose or completion of the 3-dose series), (b) intention to receive HPV vaccine, and (c) attitude toward HPV vaccine. Of the 33 articles that met the inclusion criteria, only eight specifically targeted adolescents or young adults. Among the interventions that targeted adolescents or young adults, four included both female and male participants (Doherty & Low, 2008; Gotvall, Tydén, Höglund, Larsson, 2010; Krawczyk et al., 2012a; Lloyd, Marlow, Waller, Miles, & Wardle, 2009;), and half exclusively targeted females (Brabin et al., 2010; Kwan, Tam, Lee, Chan, & Ngan, 2011; Vanderpool et al., 2013; Patel et al., 2012). Two studies tested hour-long, face-to-face presentations delivered at school (Gotvall et al., 2010; Kwan et al., 2011), three studies tested written HPV fact sheets (Lloyd et al., 2009; Krawczyk et al., 2012a; Patel et al., 2012), one tested an online fact sheet with a question-and-answer section and a self-quiz (Doherty & Low, 2008), and three tested brief HPV educational videos (3 to 10 minutes in length) (Brabin et al., 2010; Krawczyk et al., 2012a; Vanderpool et al., 2013). Over half of all the interventions (n = 18) compared the effectiveness of different message frames (See Fu et al., 2014 for a complete list of these studies). Of the interventions that investigated comparative message persuasiveness,
approximately half ($n = 9$) were presented as 1–2 page fact sheets or brochures (Cox, Cox, Sturm, & Zimet, 2010; Fahy & Desmond, 2010; Gerend & Barley, 2009; Gerend & Shepherd, 2007; Gerend, Shepherd, & Monday, 2008; Gerend & Sias, 2009; Juraskova, Bari, O’Brien, & McCaffery, 2011; Krieger & Sarge, 2013; Lechuga, Swain, & Weinhardt, 2011) or as online content (Gainforth & Latimer, 2012; Gainforth, Cao, & Latimer-Cheung, 2012; Leader, Weiner, Kelly, Hornik, & Cappella, 2009; Nan, 2012a; Nan, 2012b; Nan & Madden, 2012). One intervention utilized radio advertisements (Dunlop, Kashima, & Wakefield, 2010), another used videos (Hopfer, 2012), and a third employed slide presentations (DiClemente, Crosby, Salazar, Nash, & Younge, 2011). Researchers have employed various approaches to framing HPV vaccination messages including comparing (a) gain framed messages (advantages of getting vaccinated) versus loss framed messages (disadvantages of not getting vaccinated); (b) different message content foci (e.g., genital warts versus cervical cancer prevention); and (c) different presentation formats (e.g., informative versus narrative presentation styles, color priming with gray versus red, and graphic versus non-graphic display of HPV risk statistics) (Fu et al., 2014, p. 1906).

Based on the composite evidence, Fu et al. (2014) concluded that information-based interventions alone are insufficient to increase HPV vaccination rates. Even interventions that employed a rigorous design and were adequately powered to detect a significant change in vaccine uptake did not produce successful outcomes (Gottvall et al., 2010; Patel et al., 2012; Vanderpool et al., 2013). Other novel intervention strategies have been successfully employed to increase vaccine uptake and series completion, however. For instance, one study utilized text messaging to promote vaccine series completion (Kharbanda et al., 2011). This intervention successfully increased completion of the second and third dose of the HPV vaccine through text
reminders; however, participants self-selected into the text-messaging intervention, and may have been more motivated to complete the series.

**Theory-based interventions.** Several researchers have indicated that health behavior theory-based interventions are more efficient with allocating resources and more effective at changing behavior compared to interventions that lack a theoretical base (Glanz & Bishop, 2010; Sharma & Petosa, 2014; Sharma & Romas, 2010). Despite this, few published HPV vaccination interventions have employed a theoretical framework. Given that the Fu et al. (2014) review focused solely on the effectiveness of educational interventions to increase HPV vaccination related outcomes, it did not discuss whether or not theory was utilized.

Priest and Knowlden (2015) conducted a systematic review of primary prevention HPV interventions \((n = 12)\) targeting college students between 2000 and 2014 and reported a deficit of interventions that included males, were theory-based, and assessed HPV vaccine uptake or series completion. Among the interventions identified, more than half \((n = 7)\) exclusively targeted college females (Chang et al., 2013; Gerend et al., 2013; Hopfer, 2012; Juraskova et al., 2012; McKeever, 2008; Patel et al., 2012; Warren, 2010) but only one exclusively targeted college males (Mehta, Sharma, & Lee, 2013-2014). Over half \((n = 7)\) of the studies mentioned one or more theoretical frameworks for the development of the intervention (Gerend et al., 2013; Hopfer, 2012; Juraskova et al., 2012; Krawczyk et al., 2012a; McKeever, 2008; Mehta et al., 2013-2014; Patel et al., 2012). Several behavioral and social science theories were discussed including, culture-centric narrative theory \((n = 1)\) (Hopfer, 2012), development theory \((n = 1)\) (McKeever, 2008), exemplification theory \((n = 1)\) (Hopfer, 2012) health belief model \((n = 3)\) (Gerend et al., 2013; Krawczyk et al., 2012a; Mehta et al., 2013-2014), social cognitive theory \((n = 2)\) (Hopfer, 2012; McKeever, 2008), risk behavior model \((n = 1)\) (McKeever, 2008), and
theory of planned behavior \( (n = 2) \) (Juraskova et al., 2012; Patel et al., 2012). Among the interventions that discussed theory, five (Gerend et al., 2013; Krawczyk et al. 2012a; Hopfer, 2012; McKeever, 2008; Mehta et al., 2013-2014) reified the referenced theoretical framework. Of those interventions, only four operationalized one or more theoretical constructs (Hopfer, 2012; Juraskova et al., 2012; McKeever, 2008; Mehta et al., 2013–2014). Only one of the interventions operationalized and reified all constructs of a theory (Mehta et al., 2013–2014). Therefore, it was not possible to determine whether the interventions effectively applied or changed the theoretical constructs. While Mehta et al. (2013–2014) reported positive changes in HBM constructs and HPV vaccine acceptability among college males at immediate post-test, the study did not assess behavioral measures, and had an 82% attrition rate at one-month follow-up.

Overall, the results were positive as nearly all interventions \( (n = 10) \) produced one or more significant outcomes on primary or secondary measures. However, outcome measures differed considerably across interventions, and several assessed cognitive and psychosocial variables; the most commonly used outcome measures were HPV knowledge \( (n = 9) \) (Chang et al., 2013; Doherty et al., 2008; Gerend et al., 2013; Krawczyk et al., 2012a; Lambert, 2001; McKeever, 2008; Mehta et al., 2013-2014; Stock et al., 2013; Warren, 2010) and HPV vaccination intention (including HPV vaccination likelihood or willingness) \( (n = 6) \) (Chang et al., 2013; Gerend et al., 2013; Hopfer, 2012; Krawczyk et al., 2012a; Mehta et al., 2013-2014; Stock et al., 2013). Approximately one fourth \( (n = 3) \) measured HPV vaccine uptake (e.g., receiving one or more doses of the vaccine since the intervention) (Hopfer, 2012; Juraskova et al, 2012; Patel et al., 2012). Among interventions that measured HPV vaccine uptake, only one produced significant results (Hopfer, 2012). None of the studies measured HPV vaccine series completion.
To summarize, Priest and Knowlden (2015) were unable to ascertain which theories were effective with increasing HPV vaccine uptake because (a) multiple theories were discussed, (b) interventions did not adequately operationalize and reify theoretical constructs (Mehta et al., 2013-2014 is an exception), and (c) few interventions measured vaccine uptake. Operationalizing the theoretical constructs that will be applied within an intervention is critical, as is measuring changes in those constructs from pre to post-intervention. Doing so reveals which theoretical constructs are useful and to what extent, and guides the developments of more effective interventions. Further, neglecting to reify theoretical constructs can lead to issues with evaluation, replication, and dissemination of an intervention (Knowlden & Sharma, 2013).

**Theoretical Framework**

Theory is “a set of interrelated constructs (concepts), definitions, and propositions that present a systematic view of phenomena by specifying relations among variables, with the purpose of explaining and predicting phenomena” (Kerlinger, 1986, p. 9). Health behavior theory is integral to health education practice because it can help to explain why individuals do or do not engage in specific health behaviors (Glanz, Rimer & Viswanath, 2008). Additionally, health behavior theory assists health education specialists with planning, implementing, and evaluating interventions aimed to promote healthy behavior change or maintenance (National Cancer Institute, 2005). Among the limited social and behavioral science HPV vaccination research that targets males, most studies have examined demographic or descriptive factors associated with HPV vaccine acceptability and uptake (Newman et al., 2013). While this research is informative, most of these predictors are static factors that provide limited insight about leverage points to increase HPV vaccine uptake and series completion. Health behavior theory prediction models inform intervention research by assessing which variables influence behavior, and subsequently
may be operationalized and reified within an intervention. Therefore, theory-based research is needed to identify modifiable variables that impact HPV vaccination intentions and behavior of college males and can be targeted in an intervention.

**Health belief model.** The HBM is one of the most widely used intrapersonal theories to explain and predict health behaviors (Christopher, 2010; Glanz & Bishop, 2010). The HBM was developed in the 1950’s by social psychologists working in the U.S. Public Health Service to understand why individuals were not participating in free Tuberculosis screenings (Hochbaum, 1958). Thus, applying the HBM to explain other preventive behaviors, particularly those that occur in clinical settings, including HPV vaccination, is logical. In fact, the HBM has been one of the most commonly used theories to understand and predict HPV vaccination uptake or related outcomes since the vaccine was first introduced in 2006 (Bynum, Brandt, Friedman, Annang, & Tanner, 2011; Mehta et al., 2012-2013; Reiter, Brewer, Gottlieb, & McRee, 2009; Staggers et al., 2012;). However, several studies have found that the theory of planned behavior is more robust than the HBM in predicting HPV vaccination intentions and/or vaccine uptake (Bennett, Buchanan & Adams, 2012; Gerend & Shepherd, 2012; Krawczyk et al., 2012a). This will be discussed in detail in the next section.

The HBM is a value-expectancy theory, which postulates that individuals will perform a given behavior if they believe the personal benefits of the action’s outcome will exceed any issues that may occur due to engaging in the behavior (Hays, 1985). The HBM posits that health behavior is determined by personal beliefs or perceptions about a disease and the strategies available to decrease its occurrence (Hochbaum, 1958). Moreover, the HBM addresses an individual's perceptions of threat posed by a health problem (e.g., severity, susceptibility), benefits of avoiding the threat, and factors that influence the decision to act (i.e., barriers, cues to
action, and self-efficacy) (Champion & Skinner, 2008). Modifying variables such as culture, education level, past experiences, skill, and motivation are also assumed to influence health behavior; however, modifying (other) variables are not considered a primary construct or concept.

The HBM has been used to predict a variety of behaviors including but not limited to mammography, influenza vaccination, hepatitis B vaccination, and HPV vaccination (Champion, 1999; Chen, Fox, Cantrell, Stockdale & Kagawa-Singer, 2007; de Wit, Vet, Schutten & van Steenbergen, 2005; Wheldon, Buhi & Daley, 2012). Although the HBM has received considerable empirical support for its ability to predict preventive health behavior (including HPV vaccination) (Janz & Becker, 1984; Mullen, Hersey, & Iverson, 1987), it has received limited support within intervention studies (Jones, Smith, & Llewellyn, 2014; Montanaro & Bryan, 2014).

Although the HBM is applicable to a variety of preventive health behaviors, it has some inherent limitations, which may reduce its predictive ability and utility within interventions. For example, the HBM does not take into account that an individual may perform a behavior for non-health-related reasons, such as social acceptability (Janz & Becker, 1984). The HBM assumes that decision-making is a logical thought process, and does not acknowledge how emotions can influence health behavior (Glanz et al., 2008). Additionally, the HBM does not take into account actual economic and environmental factors (which may be beyond an individual’s control) that impact health behavior (Janz & Becker, 1984). Furthermore, the theoretical constructs that comprise the HBM are broadly defined and the model does not stipulate how the constructs interact (Carpenter, 2010; Glanz et al., 2008). In turn, this contributes to various operationalizations of the HBM constructs, which makes it difficult to compare results across
studies (Glanz et al., 2008; Maiman, Becker, Kirscht, Haefner, & Drachman, 1977). Lastly, the HBM does not propose strategies that may be applied to change the theoretical constructs, so it is difficult for interventionists to determine how to best promote health behavior change.

**Theory of reasoned action/Theory of planned behavior.** Fishbein and Ajzen conceptualized the theory of reasoned action (TRA) to improve understanding of the relationships between attitudes, intentions, and behaviors (Fishbein, 1967). Specifically, Fishbein and Ajzen (1975) clearly delineated underlying behavioral and normative beliefs, intentions, and behavior, as well as how these constructs could be measured. The TRA asserts that behavioral intention is the most immediate antecedent of behavior (Ajzen, 1991). Behavioral intention is a person’s readiness to perform a given behavior (Francis et al., 2004). According to the TRA, behavioral intention is determined by attitude toward the behavior and subjective norm. Attitude toward the behavior refers to an individual’s overall feeling that the behavior is favorable or unfavorable (Ajzen, 2006a). Subjective norm is an individual’s estimate of the social pressure to perform or not perform a behavior (Francis et al., 2004). The TRA has been applied to various behaviors including exercise, condom use, cyberbullying perpetration, HPV vaccination, and cervical cancer screening (Albarracin, Fishbein, Johnson & Muellerleile, 2001; Barling & Moore, 1996; Doane, Pearson, Kelley, 2014; Downs & Hausenblas, 2005; Fisher, Kohut, Salisbury & Salvadori, 2013). The TRA is based on the assumption that behavior is voluntary; therefore, success of the TRA in predicting behavior is dependent on the degree to which the behavior is under volitional control (Glanz et al., 2008).

The theory of planned behavior (TPB), an extension of the TRA, added the perceived behavioral control construct to more accurately predict behavioral intention. Perceived behavioral control is the extent to which an individual believes they are able to perform the
behavior (Francis et al., 2004). Specifically, the TPB posits that behavioral, normative, and control beliefs about a given behavior shape attitude toward the behavior, subjective norm, and perceived behavioral control, respectively, which influence behavioral intention, and subsequently, behavior. The TPB is a robust yet parsimonious intrapersonal theory that is highly predictive of human action, and has been tested in predicting behavioral intention and behavioral change in over 1,000 empirical studies (Ajzen, 1991, 2014b). The TPB has been widely used to successfully predict a number of health behaviors among college males, including leisure, sleep, exercise, condom use, heavy episodic drinking, testicular self-examination, and HPV vaccination, among others (Ajzen & Driver, 1992; Collins & Carey, 2007; Fisher et al., 2013; Heeren, Jemmott, Mandeya & Tyler, 2007; Knowlden, Sharma, & Bernard, 2012; McClanahan, Shevlin, Adamson, Bennett, & O’Neill, 2007; Norman & Conner, 2005).

The TPB utilizes a rigorous, systematic approach to “identify those issues that are most important to a person’s decisions about performing specific behaviors,” (Noel & Brewer, 2008, p. 155). Specifically, it “describes and identifies why a problem exists and searches for modifiable constructs” (Sharma & Petosa, 2014, p. 56), which makes the TPB a valuable framework for many health behavior interventions (Armitage & Talibudeen, 2010; Brewer & Rimer, 2008; Hardeman et al., 2002; Tyson, Covey, & Rosenthal, 2014). The TPB’s utility within health behavior interventions may in part be attributed to the extensive pilot work the theory requires, including a qualitative salient elicitation study with members of the priority population, followed by standardized methods for instrument development and measurement.

Despite its substantial empirical support in health behavior research (Armitage & Conner, 2001; Albarracin, Johnson, Fishbein, & Muellerleile, 2001; Cooke & French, 2008; Godin & Kok, 1996; McEachan, Conner, Taylor, & Lawton, 2011; Sheeran & Taylor, 1999; Tyson et al.,
2014), the TPB has several limitations. The TPB assumes an individual has acquired the opportunities and resources to perform a given behavior, regardless of their intention. Specifically, the TPB does not directly consider interpersonal, economic, political, and environmental factors that may influence an individual’s intention to perform a behavior. Rather, the TPB assumes that all other factors, including demographics and environment, operate through the primary constructs, and do not [independently] explain behavioral intention. As a value-expectancy theory, the TPB assumes that behavior is rooted in a rationale thought process. Consequently, the theory overlooks emotional factors (e.g., fear, mood, threat) that influence health behavior. Moreover, the TPB assumes that the relationship between behavioral intention and behavior is linear, and does not consider that behavior may change across time (Armitage & Conner, 2000). Although cross-sectional and longitudinal studies have found a strong relationship between behavioral intention and behavior (Armitage & Conner, 2001; Sheeran & Orbell, 1998; Sheeran, 2002), experimental studies with more rigorous designs have observed a much smaller effect (Webb & Sheeran, 2006). In spite of these limitations, the TPB appears to be a valuable and robust theoretical framework for predicting HPV vaccination intentions among college students.

The HBM and TPB were compared in predicting college women’s HPV vaccine uptake or intention in two independent studies; both studies reported that the TPB consistently outperformed the HBM based on amount of variance explained (Bennett, Buchanan & Adams, 2012; Gerend & Shepherd, 2012). Bennett et al. (2012) conducted a cross-sectional study with 143 college women at a medium-sized Mid-western university, and found that the TPB explained 52% of the variance in HPV vaccination intentions to vaccinate versus 43% with the HBM. To compare the HBM and TPB models’ predictive utility, Bennett et al. (2012) estimated two
hierarchical regression models; the HBM constructs explained 5% of the variance in HPV vaccination intentions \((p < .05)\) after controlling for the TPB constructs. Conversely, the TPB constructs explained 15% of the variance in HPV vaccination intentions \((p < .001)\) after controlling for the HBM constructs. Gerend and Shepherd (2012) conducted a randomized clinical trial to investigate the efficacy of three educational videos on HPV vaccine uptake among 739 young adult women attending a large southeastern university. While the message framing intervention did not impact vaccine uptake at 10-month follow-up, support for the TPB and HBM in predicting vaccine uptake was observed. Specifically, the TPB explained 39% of the variance in HPV vaccine uptake versus 26% with the HBM. When the HBM and TPB constructs were combined into one model, the HBM constructs only accounted for an additional 4% variance beyond that explained by the TPB constructs, indicating considerable overlap in the variance accounted for by constructs from both theories (Gerend & Shepherd, 2012). In both studies, the TPB was deemed superior to the HBM in terms of its predictive utility.

Juraskova et al. (2012) investigated the effect of differential information framing on 159 unvaccinated Australian female university psychology students’ behavioral intentions to receive the HPV vaccine using the TPB and the moral norm construct. Although no effect of information framing on behavioral intention was detected, attitude \((p = .001)\), subjective norm \((p = .001)\), and perceived behavioral control \((p = .002)\) constructs explained 54.4% of the variance in vaccination intentions within the sample. When the moral norm was added to the hierarchical regression model, 60.6% of the variance in behavioral intentions was explained. Further, behavioral intention predicted a relatively small, but significant proportion (9.6%) of variability in HPV vaccine uptake at 2-month follow-up.
Fisher et al. (2013) tested the TPB in predicting HPV vaccination intentions of college students at a Canadian university, and found that attitudes and social norms accounted for 53% and 44% of the variance in women’s \((n = 146)\) and men’s \((n = 118)\) vaccination intentions, respectively. Perceived behavioral control was not tested directly; the study measured perceived ability to get vaccinated instead, which was assessed on the basis of perceived ease or difficulty of undergoing HPV vaccination. Although perceived ability to get vaccinated was not a significant predictor of HPV vaccination intentions among men or women within the multivariate analyses, it was significantly correlated with women’s intentions \((p < .01)\) in a univariate analysis.

Geshnizjani, Jozkowski, and Middlestadt (2013) tested the global constructs of the Reasoned Action Approach (RAA) in predicting intentions to go to the doctor to ask for the HPV vaccine among 279 college women attending a large Midwestern university. The RAA is the most recent formulation of the TPB and the integrated behavioral model, and assumes that behavioral intention is the immediate determinant of behavior (Fishbein & Ajzen, 2010). The RAA, like the TPB, asserts that the global constructs of attitude toward the behavior, perceived norm, and perceived behavioral control combine to determine behavioral intention. This study reported that attitude towards getting the vaccine \((p < .001)\), perceived norm \((p < .001)\), and perceived behavioral control \((p = .017)\) accounted for 49.3% of the variance in college women’s behavioral intentions to go to the doctor to ask for the HPV vaccine.

Ratanasiripong, Cheng, and Enriquez (2013) conducted a cross-sectional study that was guided by the TPB, which aimed to identify factors that influence the decision to obtain an HPV vaccine among 384 vaccinated and unvaccinated college women. Among non-vaccinees, knowledge, attitudes toward the HPV vaccine, attitude toward getting vaccinated against HPV,
subjective norms, and perceived behavioral control predicted intention to receive the HPV vaccine \((p = .00)\), and explained 65% of the variance. However, only subjective norms \((p < .01)\) and attitude toward getting vaccinated against HPV \((p < .01)\) were significant predictors in the model. The study also found that attitude toward getting vaccinated against HPV, subjective norms, and perceived behavioral control were significantly correlated with HPV vaccine uptake. The model remained significant \((p < .01)\) when age, ethnicity, and age of first sexual intercourse variables were included, and all six variables accounted for approximately 19%–25.4% of the variability in vaccine uptake. Of particular importance, subjective norms \((p = .00)\) and perceived behavioral control \((p = .00)\) remained significant in the multivariate model predicting vaccine uptake, after controlling for the indirect predictors (e.g., age, ethnicity, age of first sexual intercourse).

Based on these findings, the TPB appears to be a superior theoretical framework for predicting HPV vaccination intentions among college females, and likely among college males. The HPV vaccine requires multiple doses, which are essential to the vaccine’s efficacy in preventing HPV infection; therefore, it is necessary to develop, implement, and evaluate interventions that promote series completion (Crowe et al., 2014; Shapiro, Joyal-Desmarais, Perez, & Rosberger, 2014; Widdice, Bernstein, Leonard, Marsolo, & Kahn, 2011). This study tested the predictive validity of the TPB in predicting college males’ behavioral intention to get all three doses of the HPV vaccine within the next 12 months as a formative step to the development of an effective intervention.

**Summary**

In this chapter, the origin, transmission, and prevalence of HPV, economic and health consequences of HPV infection, HPV prevention methods, benefits and limitations of HPV
vaccination, vaccine coverage, priority populations, previous HPV and HPV vaccine education efforts, and theory-based HPV vaccination research specific to college students were discussed. The methodology for this study will be presented in Chapter 3. Results from the analyses follow in Chapter 4, with a discussion of the findings presented in Chapter 5.
CHAPTER 3

METHODOLOGY

Human papillomavirus (HPV) is the most common sexually transmitted infection in the United States, with individuals 15 to 24 years of age accounting for approximately 75% of all new HPV infections (CDC, 2012; Partridge et al., 2007). Since HPV is transmitted from skin-to-skin contact and condoms do not cover all areas of the anogenital region during sexual activity, HPV vaccination is positioned as the most efficacious strategy to prevent infection and reduce HPV morbidity. Despite this fact, HPV vaccine initiation and series completion rates have remained exceedingly low, particularly among vaccine-eligible males. Estimates from 2012 indicate that as few as 2.3% of males 19 to 26 years of age had received one or more doses of HPV vaccine (Williams et al., 2014). A national study conducted in Spring 2014 reported that only 29% of college males had received the HPV vaccine, compared to 59% of their female counterparts (American College Health Association [ACHA], 2014a).

In light of the facts that the greatest burden of HPV-associated cancers occur in the cervix, and the HPV vaccine is most effective when administered prior to sexual debut, it is logical that the majority of HPV vaccination research in the social and behavioral sciences has targeted females and parents of pre-adolescent/adolescent females. Unfortunately, older adolescent and young adult males who are at high risk for infection and eligible for the HPV vaccine are often overlooked. Moreover, among the studies that target males, most only examined demographic or descriptive predictors associated with HPV vaccine acceptability and uptake (Newman et al., 2013). Most of these predictors are static factors that provide limited
insight about leverage points to increase vaccine uptake. Theory-based research is needed to identify additional modifiable variables that impact HPV vaccination intentions among college males and may be targeted in an intervention. Therefore, the purpose of this study was to operationalize the direct constructs of the theory of planned behavior (TPB) to predict the HPV vaccination behavioral intentions of male undergraduate college students attending a large public southeastern university.

This instrument was designed to assess theory-based correlates of HPV vaccination intentions and aid in designing and evaluating relevant TPB-based HPV vaccination interventions for college males. In this chapter, a thorough description of the research design, study participants, instrumentation process, data collection procedures, and data analysis methodology are provided.

**Research Design**

A non-experimental, cross-sectional study design was employed in this study. A cross-sectional study design entails collecting data to make inferences about a given population at one point in time (Hall, 2008). Cross-sectional designs are commonly utilized for observational research in health education (Cottrell & McKenzie, 2011).

**Population**

**Inclusion criteria.** The sample was comprised of college males between 18 and 26 years of age attending a large public southeastern university who had not received any doses of the HPV vaccine.

**Instrumentation Methodology**

The instrumentation process entailed constructing and piloting a TPB-based salient elicitation instrument, content analyzing results from the salient elicitation study for item
generation, conducting Flesch Reading Ease and Flesch-Kincaid Grade Level tests, undergoing expert panel review for face and content validity, piloting the quantitative instrument, conducting test-retest, and collecting primary data to test the model. Specifically, confirmatory factor analysis (CFA), internal consistency, and structural equation modeling (SEM) were used to assess construct validity, internal reliability, and predictive validity, respectively.

**Purpose.** The purpose of this instrument was to accurately and reliably measure TPB-based constructs hypothesized to predict the HPV vaccination intentions of vaccine-eligible college males. There were four primary objects of interest for this instrument: (a) attitude toward the behavior, (b) subjective norm, (c) perceived behavioral control, and (d) behavioral intention. Given the parsimonious nature of TPB, the principal investigator (PI) deemed it appropriate to measure all of the TPB constructs, with the exception of HPV vaccination behavior. Behavior was not included as an object of interest because it was beyond the scope of this study. Although prior research indicates that behavioral intention frequently predicts behavior, it will not be possible to determine how many participants get all three doses of the HPV vaccine in 12 months due to time constraints in the current study (Webb & Sheeran, 2006). Measurement of HPV vaccination behavior would have required a prospective study design, which would have followed up with participants 12 months after completion of the initial instrument. This study sought to measure behavioral intentions of unvaccinated college males. College males who had received one or more doses of the vaccine would likely be influenced by past behavior and would have skewed the results. Behavioral intention was defined in terms of its target, action, context, and time (TACT) (Francis et al., 2004). Therefore, for the purpose of this study, behavioral intention was defined as a college male’s (target) intention or readiness to get (action, as in get HPV vaccine) all three doses (context) of HPV vaccine in the next 12 months (time).
Qualitative elicitation study. Qualitative and quantitative research methods are used in the development of TPB-based instruments (Ajzen, 2006a; Francis et al., 2004). Elicitation is a qualitative, formative research technique designed to understand the cognitive structure underlying people's decisions to perform a behavior (Fishbein & Ajzen, 2010). Salient belief elicitation is the standard practice for developing TPB-based instruments and is based on the most frequently discussed responses from persons in a given population (Ajzen, 2006a, 2014a; Ajzen & Fishbein, 1980; Giles et al., 2007; Manstead & Parker, 1995; Rhoades, Kridli & Penphrase, 2011; Sutton et al., 2003). Conducting a salient belief elicitation prior to testing the TPB in a new population helps to construct an instrument that is relevant to the population. Based on a review of the literature, no studies have utilized salient elicitation with college males to aid in developing relevant TPB items specific to HPV vaccination.

Therefore, a salient elicitation questionnaire was constructed for this purpose, using an example provided by Francis et al. (2004). The questionnaire included ten demographic questions and nine open-ended questions, which inquired about participants’ attitude toward the behavior, subjective norm, and perceived behavioral control for getting all three doses of the HPV vaccine in the next 12 months (See Appendix A). The PI utilized verbiage identical to that of Francis et al. (2004) for the instructions to participants and free format questions, with the exception of the priority population and behavior being studied. For example, within the Francis et al. (2004) sample questionnaire, participants were asked, “What do you believe are the advantages of [measuring the patient’s blood pressure during a consultation]?” For the salient elicitation questionnaire constructed in the current study, the question was rephrased as, “What do you believe are the advantages of getting all three doses of the human papillomavirus (HPV) vaccine in the next 12 months?” In addition to the open-ended questions, standard demographic
and descriptive questions were included on the questionnaire. Once the questionnaire was constructed, the PI and dissertation committee co-chairs independently reviewed the questionnaire items and approved them.

The questionnaire used in the pilot salient elicitation study was modified from the salient elicitation questionnaire. The pilot questionnaire included a different set of instructions for respondents and four additional questions regarding the clarity of the directions and items, ease of the layout, and overall suggestions to improve the questionnaire. Specifically, the instructions to participants requested, “Before proceeding to question one, please flip to page five and read questions 19–22. As you complete the questionnaire, please encircle any words or questions that are unclear or do not make sense to you.” To assess readability and comprehensibility, the following questions (items 19–22) were included on the questionnaire, “Are the directions clear and concise? If not, please write alternatives or suggestions here”; “Are the questions easy to understand? If not, please list which questions were difficult to understand and write suggestions for improvement here”; “Is the layout clear and easy to use for answering the questions? If not, please write suggestions for improvement here”; and “Please provide any additional comments or suggestions on how to improve the questionnaire here.”

**Pilot salient elicitation study procedures. Overview.** A pilot test of the salient elicitation questionnaire was conducted with members of the priority population in order to assess its readability and comprehensibility. A secondary purpose was to determine how long it took participants to complete the pilot questionnaire. Permission to conduct the pilot and salient elicitation study was granted by The University of Alabama (UA), Institutional Review Board (IRB) in July 2014 (See Appendix B). In line with Ajzen’s (2006) and Francis et al.’s (2004) recommendations for conducting an elicitation study, the primary investigator opted to recruit
pilot study participants from the same population as those who would be recruited for primary data collection. However, each course section was only recruited to participate in one phase of the study. For practical purposes, pilot study participants were recruited from students enrolled in a face-to-face Personal Health course offered in the College of Human Environmental Science (CHES). Personal Health is a non-major, introductory level undergraduate course.

The PI contacted one UA, Department of Health Science Personal Health instructor via e-mail and requested permission to conduct the study with students currently enrolled in one section of the individual’s course. The e-mail outlined the study and its time requirements to the instructor. Additionally, the e-mail requested that instructors provide up to five extra credit points for students’ participation in the study or completion of the alternative activity. Pilot samples generally include a minimum of five individuals who are representative of the priority population (Goodman, Kuniavsky & Moed, 2012). For the purpose of this study, 14 participants were sought for pilot testing purposes. Estimated time to complete the questionnaire was set at 25 minutes.

**Data collection.** The PI invited students within a class volunteered by their respective Personal Health instructor to participate in the pilot study. Students were recruited from one section of Personal Health on Friday, August 22, 2014. Upon entering the classroom, the PI introduced herself to the class, and asked the instructor to stand outside the room during the study recruitment and administration process. Once the instructor exited the classroom, the PI provided some background information and explained the purpose of the study. The PI utilized PowerPoint slides to reinforce this information. The PI gave each willing and potentially eligible student a packet, which included an information sheet for research, an extra credit form, and a
salient elicitation pilot questionnaire. The information sheet for research and extra credit form were paper-clipped to the questionnaire (See Appendix C).

The information sheet for research provided details about the study, including the purpose, benefits and risks to participants, procedures for maintaining confidentiality, participants’ rights, and alternatives to participating. The PI read each section of the information sheet for research to potential participants and reinforced that their participation was confidential and voluntary. The PI gave students time to read the information sheet independently and then allowed for questions about the study and its procedure. All potential study participants were made aware that completing the questionnaire indicated their consent for their responses to be used for research. Next, participants were asked to remove the information sheet for research from the packet and keep it for their personal records. Participants were informed that they should complete the extra credit form if they wished to receive extra credit points for their participation in the study. The extra credit form requested that students provide their first and last name, course prefix and number, course section, and instructor name. Students were verbally prompted to review the instructions on the first page of the questionnaire and the corresponding questions on the last page before completing the questionnaire. Students who did not wish to participate in the study or who did not meet inclusion criteria were given the option to complete a time-equivalent, incentive-equivalent alternative activity. The alternative activity involved reviewing an article on healthy sleep, and responding to nine multiple choice, true/false, fill-in-the-blank, and open-ended questions (See Appendix D).

At the end of the informational period, the PI gave the students approximately 25 minutes to complete the questionnaire. At the end of the time, the PI asked students to turn their completed questionnaires over. The PI picked up the questionnaires and placed them into a
concealed envelope. Next, the PI collected the extra credit sheets and placed them into a separate concealed envelope. Next, the PI collected the alternative activity answer sheets and placed them into a separate concealed envelope. After all papers were collected, the investigator explained to participants that their feedback on the questionnaire's directions, items, and layout would be used to improve the questionnaire for future participants. Afterward, the PI thanked the class for their time and asked the instructor to come back into the classroom. Once the instructor re-entered the room, the primary investigator left the classroom with the envelopes.

**Data analysis.** Eighteen males were present in class on the date of the pilot study; of those, 14 eligible males participated in the pilot test. The PI reviewed each completed questionnaire, with careful consideration given to the feedback provided for items 19–22. All of the participants indicated that the directions were clear, items were easy to understand, and the format was easy to follow along. None of the participants encircled words or provided suggestions to improve the questionnaire. Thus, the questionnaire was deemed to be at an appropriate level of readability and comprehensibility for college males. The entire study recruitment and questionnaire administration process took 30 minutes, which was what the PI had anticipated. Consequently, no modifications were made to the study recruitment and data collection procedures. The final salient elicitation questionnaire is presented in Appendix A. Since no changes or suggestions to improve the questionnaire were offered, the data from the pilot test were incorporated into the salient elicitation study.

**Salient elicitation study. Overview.** Godin and Kok (1996) recommend collecting data from a minimum of 25 participants within the priority population. Sample size recommendations for the qualitative elicitation study are based on data saturation from a representative sample of
the priority population. For the purpose of this study, and to account for incomplete responses, a sample size of 30 unvaccinated college males between 18 and 26 years of age was sought.

Study participants were recruited from students enrolled in face-to-face Personal Health courses offered within the Department of Health Science, housed in CHES during the fall semester of 2014. The PI contacted four Personal Health instructors via e-mail and requested permission to conduct the study with students currently enrolled in their course. The e-mail outlined the study and its time requirements to the instructor. Moreover, the e-mail requested that instructors provide up to five extra credit points for students’ participation in the study or completion of the alternative activity. Participants were requested to respond to the TPB items in a free-response format, whereby they handwrote their responses directly onto the questionnaire. Several researchers support this method of data collection for TPB-based elicitation studies (Ajzen, 2006a; Francis et al., 2004; Geshnizjani, Jozkowski, & Middlestadt, 2013). Estimated time to complete the questionnaire was set at 20 minutes.

**Data collection.** The PI invited students within classes volunteered by their respective Personal Health instructors to participate in the study. Students were recruited from three sections of Personal Health on Friday, August 22, 2014 and Monday, August 25, 2014. Upon entering the classroom, the PI introduced herself to the class, and asked the instructor to stand outside the room during the study recruitment and administration process. Once the instructor exited the classroom, the PI provided some background information and explained the purpose of the study. The PI utilized PowerPoint slides to reinforce this information. The PI gave each willing and potentially eligible student a packet, which included an information sheet for research, an extra credit form, and a salient elicitation questionnaire (See Appendix C). The information sheet for research and extra credit form were paper-clipped to the questionnaire.
The information sheet for research provided details about the study, including the purpose, benefits and risks to participants, procedures for maintaining confidentiality, participants’ rights, and alternatives to participating. The PI read each section of the information sheet for research to potential participants and reinforced that their participation was confidential and voluntary. The PI gave students time to read the information sheet independently and then allowed for questions about the study and its procedure. All potential study participants were made aware that completing the questionnaire indicated their consent for their responses to be used for research. Next, participants were asked to remove the information sheet for research from the packet and keep it for their personal records. Participants were informed that they should complete the extra credit form if they wished to receive extra credit points for their participation in the study. The extra credit form requested that students provide their first and last name, course prefix and number, course section, and instructor name. Students were verbally prompted to review the instructions on the first page of the questionnaire and the corresponding questions on the last page before completing the questionnaire. Students who did not wish to participate in the study or who did not meet inclusion criteria were given the option to complete a time-equivalent, incentive-equivalent alternative activity. The alternative activity involved reviewing an article on healthy sleep, and responding to nine multiple choice, true/false, fill-in-the-blank, and open-ended questions (See Appendix D).

At the end of the informational period, the PI gave the students approximately 20 minutes to complete the questionnaire. At the end of the time, the PI asked students to turn their completed questionnaires over. The PI picked up the questionnaires and placed them into a concealed envelope. Next, the PI collected the extra credit sheets and placed them into a separate concealed envelope. Next, the PI collected the alternative activity answer sheets and placed them
into a separate concealed envelope. After all papers were collected, the PI thanked the students for their time and asked the instructor to come back into the classroom. Once the instructor re-entered the room the PI left the classroom with the envelopes.

**Data analysis.** Twenty-two males were present in class on the date of the salient elicitation study; of those, 16 eligible males participated in the study. Additionally, since no changes were recommended to the open-ended questionnaire in the pilot test, responses from those participants were incorporated into the salient elicitation study results; therefore, a total of 30 eligible males participated in the salient elicitation study. Once the sample size criteria were met, the PI and one of the dissertation committee co-chairs independently content analyzed the salient elicitation questionnaire responses to increase the validity of the findings (Francis et al., 2004). Content analysis is recommended by Ajzen (2006) and is a commonly used method for analyzing results from a TPB-based elicitation study (Ajzen & Driver, 1991; Manstead & Parker, 1995; Rhoades, Kridli & Penphrase, 2011; Sutton et al., 2003). Specifically, the responses were content analyzed according to the direct TPB categories (attitude toward the behavior, subjective norm, perceived behavioral control) with similar responses grouped together, labeled as a theme, and the frequency of responses for each theme was recorded. Next, the themes were listed in order from the most frequently mentioned to the least frequently mentioned. The PI and dissertation committee co-chair compared lists and discussed the extracted themes until 100% consensus was achieved. Afterward, the second dissertation committee co-chair reviewed the consensus document (See Appendix E) and confirmed the extracted themes. Analysis identified seven salient advantages/disadvantages including: protection against HPV, healthy, advantageous, time consuming, painful, unnecessary, and good idea. Parent(s), family members, and friends were the most salient referents. Vaccine cost, vaccine accessibility, and busy
schedule were the most salient factors/circumstances. Items for the first draft of section one of the instrument were framed according to the universal definitions of the theory of planned behavior constructs of attitude toward the behavior, subjective norm, perceived behavioral control, and generalized intention to perform the behavior. A summary of the qualitative salient elicitation study results is provided in Table 3.1. The demographic characteristics of the qualitative elicitation study sample are summarized in Table 3.2.

Table 3.1

**Qualitative Elicitation Study Analysis Summary (N =30)**

<table>
<thead>
<tr>
<th>TPB Elicitation Questions</th>
<th>Most Frequent Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attitude Toward the Behavior</strong></td>
<td></td>
</tr>
</tbody>
</table>
| 1. What do you believe are the advantages of getting all three doses of the HPV vaccine in the next 12 months? | • Healthy/HPV vaccine helps you to be healthy  
• Protection/The HPV vaccine protects against HPV |
| 2. What do you believe are the disadvantages of getting all three doses of the HPV vaccine in the next 12 months? | • Cost/HPV vaccine is costly  
• Inconvenient  
• No disadvantages to getting HPV vaccine  
• Painful  
• Some people may have negative reactions to the HPV vaccine shots  
• Time consuming  
• Unnecessary |
| 3. Is there anything else you associate with your own views about getting all three doses of the HPV vaccine in the next 12 months? | • Getting the vaccine is a good idea  
• Lack knowledge about HPV and HPV vaccine*  
• Misconceptions** |
| **Subjective Norm** |
| 4. Are there any individuals or groups who would approve (directly or indirectly) of your getting all three doses of the HPV vaccine in the next 12 months? | • Family members  
• Friends  
• Parent(s) |
| 5. Are there any individuals or groups who would disapprove (directly or indirectly) of your getting all three doses of the HPV vaccine in the next 12 months? | • Friends  
• Parents  
• People who are anti-vaccination  
• People who are religious |
6. Is there anything else you associate with other people’s views about you getting all three doses of the HPV vaccine in the next 12 months?

Perceived Behavioral Control
7. What factors or circumstances would make it easy or enable you to get all three doses of the HPV vaccine in the next 12 months?

- Having time to get the HPV vaccine would make it easy/enable college males to get HPV vaccine
- Having more info would make it easy/enable college males to get HPV vaccine*
- Having the vaccine be easily accessible would make it easy/enable college males to get HPV vaccine
- If the vaccination is quick, it would make it easy/enable college males to get HPV vaccine
- Making the HPV vaccine affordable would make it easy/enable college males to get HPV vaccine
- Offering the vaccine at the university’s student health center would make it easy/enable college males to get HPV vaccine

8. What factors or circumstances would make it difficult or impossible for you to get all three doses of the HPV vaccine in the next 12 months?

- Being expensive would make it difficult or impossible to get HPV vaccine
- Busy class schedules would make it difficult or impossible for college males to get HPV vaccine
- Inconvenience would make it difficult or impossible for college males to get HPV vaccine
- No factors or circumstances that would make it difficult for college males to get HPV vaccine
- The pain of the shot would make it difficult or impossible to get HPV vaccine
- Working would make it difficult or impossible for college males to get HPV vaccine

9. Are there any other thoughts or opinions that you would like to share about getting all three doses of the HPV vaccine in the next 12 months?

- N/A – No additional thoughts or opinions to share about getting the HPV vaccine
- More education is needed about HPV and HPV vaccination for college males and the public to get vaccinated*

*Responses indicated that participants lacked knowledge about HPV and HPV vaccination;
** = Responses indicated that participants held misconceptions about HPV and/or HPV vaccination.
Table 3.2

Summary of Demographic Frequency Statistics for the Elicitation Study Sample (N = 30)

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>4</td>
<td>13.3</td>
</tr>
<tr>
<td>19</td>
<td>7</td>
<td>23.3</td>
</tr>
<tr>
<td>20</td>
<td>7</td>
<td>23.3</td>
</tr>
<tr>
<td>21</td>
<td>4</td>
<td>13.3</td>
</tr>
<tr>
<td>22</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>23</td>
<td>3</td>
<td>10.0</td>
</tr>
<tr>
<td>24</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>25</td>
<td>2</td>
<td>3.3</td>
</tr>
<tr>
<td>26</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>HPV Awareness</strong>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>15</td>
<td>50.0</td>
</tr>
<tr>
<td>No</td>
<td>15</td>
<td>50.0</td>
</tr>
<tr>
<td><strong>HPV Vaccine Awareness</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>9</td>
<td>30.0</td>
</tr>
<tr>
<td>No</td>
<td>21</td>
<td>70.0</td>
</tr>
<tr>
<td><strong>Academic Status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freshman</td>
<td>8</td>
<td>26.7</td>
</tr>
<tr>
<td>Sophomore</td>
<td>7</td>
<td>23.3</td>
</tr>
<tr>
<td>Junior</td>
<td>4</td>
<td>13.3</td>
</tr>
<tr>
<td>Senior</td>
<td>10</td>
<td>33.3</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>3.3</td>
</tr>
<tr>
<td><strong>Sexual Orientation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heterosexual or straight</td>
<td>30</td>
<td>100.0</td>
</tr>
<tr>
<td>Gay</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Bisexual</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Asexual</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>1</td>
<td>3.3</td>
</tr>
<tr>
<td>Non-Hispanic</td>
<td>29</td>
<td>96.7</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>6</td>
<td>20.0</td>
</tr>
<tr>
<td>Asian</td>
<td>1</td>
<td>3.3</td>
</tr>
<tr>
<td>Caucasian</td>
<td>20</td>
<td>66.7</td>
</tr>
<tr>
<td>More than one race</td>
<td>1</td>
<td>3.3</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>3.3</td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>3.3</td>
</tr>
<tr>
<td><strong>Sexual History</strong>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>27</td>
<td>90.0</td>
</tr>
<tr>
<td>No</td>
<td>3</td>
<td>10.0</td>
</tr>
</tbody>
</table>

*Note. *HPV Awareness was assessed by asking participants, “Have you heard about human papillomavirus (HPV) before this questionnaire?” **HPV Vaccine Awareness was assessed by asking, “Have you heard about the vaccine for human papillomavirus (HPV), also known as Gardasil or Cervarix, before this questionnaire?” ***Sexual history was assessed by asking, “Have you ever had oral, anal, or vaginal sex?”*
**Quantitative instrumentation.** The PI adhered to Ajzen’s (2006) and Francis et al.’s (2006) recommendations for the structure and scaling of the direct TPB items. Item stems and endpoints were developed based on the themes that were extracted from the elicitation study results and relevant HPV vaccination literature. A 7-point semantic differential scale item was employed for each of the TPB items, which is recommended and considered optimal by the TPB theorist (Ajzen, 2006a, 2014a). A minimum of three items were developed for each TPB construct. The mean of the item scores for each TPB construct was used to provide an overall construct score. An operational definition is a precise explanation of the process for transforming a construct into a measureable variable with a set score range (Sharma & Petosa, 2014). The operational definitions of each of the indicator variables are described in Chapter 1 under the operational definition heading. Standard demographic questions were selected to characterize the sample and are described in detail in section two. Sexual behavior and relationship status items were modified from questions on the National College Health Assessment (NCHA) II survey and were included to inform future HPV health education programs (American College Health Association, ACHA, 2011). Permission was sought and obtained from the Director of the ACHA-NCHA Program (See Appendix F). The scoring guide for the instrument can be reviewed in Appendix G.

Once the initial instrument was drafted, its readability was assessed using the Flesch Reading Ease and the Flesch-Kincaid Grade Level tests. The instrument was word processed in Microsoft© Word for Mac 2011 and readability tests were conducted using its readability statistics function. The instrument had a Flesch Reading Ease score of 70.5, which is considered in the “fairly easy” range for reading ease. For this index, scores between 60 and 70 are considered good (Flesch, 1948; Sharma & Petosa, 2014). The Flesch-Kincaid Grade Level test
score was 6.3, meaning the reading level of the instrument was between a 6th and 7th grade-level. Instruments in health education are often developed for individuals with seventh to eighth grade reading levels (Sharma & Petosa, 2014). Consequently, the readability scores were deemed acceptable for college males. Once objective readability was established, the instrument was sent to a panel of experts for confirmation of readability, and face and content validation.

**Panel of experts.** A panel of seven experts assessed readability, face validity, and content validity of the instrument over one round. Panel members were identified based on their expertise in one or more of the following areas: measurement and instrument development, HPV vaccination, TPB, and college populations (See Appendix H). Six of the panel members were university faculty members; in particular, one of those members was also a medical director and medical doctor with board certifications in obstetrics and gynecology, gynecologic endoscopy, forensic medicine, and family medicine obstetrics. The non-academic panel member was a nurse practitioner and women’s health coordinator at a university-based student health center. Upon identification of potential members, e-mail invitations were sent to request their willingness to share their expertise by participating as expert panel members. Seven experts agreed to serve on the panel.

Each panel member received an electronic packet that included a cover letter explaining the purpose of the study, a copy of the paper and pencil draft instrument, and an evaluation form. The instrument evaluation form was used to assess readability, face validity, and content validity of the instrument (See Appendix I). Panel members were asked to provide typewritten feedback in the blank boxes formatted under each item on the form. Additionally, members were asked to provide a general critique of the instrument and to offer suggestions for improvement based upon their area(s) of expertise. The PI requested that the completed evaluation form be returned
electronically within a two-week time frame. Based on the panel’s feedback, several minor modifications were made to the instrument, which are summarized in Table 3.3. The modified version of the instrument is described in detail in the next section.

Table 3.3
Summary of Changes to Instrument as Recommended by Panel of Experts

<table>
<thead>
<tr>
<th>Instrument Modifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>• A “don’t know” option was added for screening item 3, “Have you received any doses of the human papillomavirus (HPV) vaccine?” The wording “popularly known as Gardasil or Cervarix” was removed from the item to avoid confusing respondents.</td>
</tr>
<tr>
<td>• In the instructions, the word “responses” replaced “answers”, as in, “The questions in this section use rating scales with seven potential responses.” The phrase, “…which most closely matches your opinion” replaced, “please circle one number that is true for you.” The sentence, “please do not leave any questions blank” was removed from the instructions.</td>
</tr>
<tr>
<td>• The behavioral intention item, “How likely is it that you will get all three doses of the HPV vaccine in the next 12 months?” was removed because it was redundant.</td>
</tr>
<tr>
<td>• “Very” was added to the “bad – good” attitude toward the behavior endpoints, as in “Very bad – Very good”.</td>
</tr>
<tr>
<td>• The following attitude toward behavior item with “Unpleasant – Pleasant” endpoints was removed from the instrument.</td>
</tr>
<tr>
<td>• “Very” was added to the “Unhealthy – Healthy” attitude toward the behavior endpoints, as in “Very unhealthy – Very healthy”.</td>
</tr>
<tr>
<td>• “Extremely” was added before “Painful” in the attitude toward the behavior endpoint, as in, “Extremely painful – Painless”.</td>
</tr>
<tr>
<td>• “Extremely” was added to the “Harmful – Beneficial” attitude toward the behavior endpoints, as in “Extremely harmful – Extremely beneficial”.</td>
</tr>
<tr>
<td>• The perceived behavioral control item, “It is up to me whether I get all three doses of HPV vaccine in the next 12 months; Completely false – Completely true” was removed from the instrument.</td>
</tr>
<tr>
<td>• The perceived behavioral control item, “I am able to get all three doses of HPV vaccine in the next 12 months; Completely disagree – Completely agree” was removed from the instrument.</td>
</tr>
<tr>
<td>• The endpoints in the perceived behavioral control item, “If I wanted to, I am sure I could get all three doses of HPV vaccine in the next 12 month” were changed from “Completely disagree – Completely agree” to “Completely unsure – Completely sure”.</td>
</tr>
<tr>
<td>• The following perceived behavioral control item was added to the instrument, “I am confident I can find a healthcare provider (for example, clinic, health center, physician’s office) where I can get all three doses of the HPV vaccine in the next 12 months; Very unconfident – Very confident”.</td>
</tr>
<tr>
<td>• The HPV knowledge scale was removed from the instrument.</td>
</tr>
</tbody>
</table>
| • The “Before you were invited to participate in this study, had you heard about human papillomavirus (HPV)?” item became the first demographic item, followed by “Before you were invited to participate in this study, had you heard about the vaccine for human papillomavirus”. The phrase, “…also known as Gardasil or Cervarix” was removed from the
...question about prior vaccine awareness.

- Definitions of oral sex, vaginal sex, and anal sex were provided before the questions that asked respondents about their past sexual behaviors. For example, “Oral sex means mouth on a penis, vagina, or anus (butt)”.  
- Sexual behavior items were listed in rank order based on the prevalence of each behavior; oral sex items were provided first, then vaginal sex items, followed by anal sex items.  
- The item that assessed the number of oral, anal, or vaginal sexual partners respondents’ had in their lifetime was modified into three separate questions, one for each behavior. For example, “During your lifetime, with how many people have you had oral sex…?”  
- For items that asked about sexual activity in the last 30 days, response options were re-worded as “Yes; No, have never engaged in this activity; No, have engaged in this sexual activity in the past, but not in the past 30 days”.

**Instrument components.** Participants completed a 41-item instrument, divided into two sections that were designed to measure attitude toward the behavior, subjective norm, perceived behavioral control, behavioral intention, demographic, and descriptive variables. Section one measured each of the TPB constructs and section two assessed demographic and descriptive information.

**Theory of planned behavior subscales.** Section one of the instrument was comprised of 20 items designed to measure the primary TPB constructs.

*Behavioral intention subscale.* Behavioral intention was measured using a 7-point semantic differential scale. Three items were used to assess this construct (items 1, 2, 3). The phrases, “I intend,” “I plan,” and “I will try” were used to assess the behavioral intention of respondents to get all three doses of HPV vaccine in the next 12 months. Scale endpoints included *completely disagree–completely agree.* A range of scores from 3 to 21 was possible for the behavioral intention scale. The overall construct score was determined by calculating the mean of the item scores. Higher behavioral intention scores indicated greater intention to get all three doses of the HPV vaccine in the next 12 months.

*Attitude toward the behavior subscale.* The second set of items in section one measured attitude toward the behavior, specifically, respondents’ overall evaluation of getting all three
doses of HPV vaccine in the next 12 months. Attitude toward the behavior was measured using a 7-point semantic differential scale items based on bipolar adjectives. The stem statement that preceded the list of bipolar adjectives was, “I think getting all three doses of the HPV vaccine in the next 12 months would be”. Instrumental and affective items were included to comprehensively assess how respondents evaluated the behavior (Ajzen, 2006a; Ajzen et al. 1991). Instrumental items have a cognitive emphasis, and measure the extent to which respondents believe performing a behavior is advantageous/beneficial or disadvantageous/costly (Hales, Evenson, Wen, & Wilcox; 2010). Affective items have an emotional focus, and assess the extent to which respondents believe a behavior is likeable/enjoyable or dislikeable/non-enjoyable. Sample instrumental attitude toward the behavior item endpoints included, very unhealthy–very healthy and extremely painful–painless. Sample affective attitude toward the behavior endpoints include, very bad–very good. Seven items were used to assess this construct (items 4, 5, 6, 7, 8, 9, 10). A range of scores from 7 to 42 was possible for the attitude toward the behavior scale. The overall construct score was determined by calculating the mean of the item scores. Higher scores indicated a more favorable attitude toward getting all three doses of the HPV vaccine in the next 12 months.

Subjective norm subscale. The third set of items in section one assessed subjective norm, or perceived social pressure to get all three doses of HPV vaccine in the next 12 months. Subjective norm was measured using injunctive norm items. Injunctive norm items assess what referent others think a person should do (Francis et al., 2004). Four items were used to assess the subjective norm construct (items 11, 12, 13, 14). Sample items included, “Most people who are important to me think that I should get all three doses of the HPV vaccine in the next 12 months” and, “My parent(s) or legal guardian(s) would like me to get all three doses of the HPV vaccine
in the next 12 months” with completely disagree–completely agree endpoints. A range of scores from 4 to 28 was possible. The overall construct score was determined by calculating the mean of the item scores. Higher scores indicated greater social pressure to get all three doses of the HPV vaccine in the next 12 months.

Perceived behavioral control subscale. The fourth set of items in section one of the instrument measured perceived behavioral control to get all three doses of the HPV vaccine in the next 12 months. The items intended to capture respondents’ confidence in their capability to perform the target behavior (Francis et al., 2004). In order to achieve this, respondents were assessed on their domain-specific self-efficacy and beliefs about the controllability of the behavior. To assess self-efficacy, respondents were asked to indicate how difficult it would be to perform the behavior, and how confident they are that they could perform it. One sample item included, “If I wanted to, I am sure I could get all three doses of the HPV vaccine in the next 12 months” with completely unsure–completely sure endpoints. Another sample item was “For me to get all three doses of HPV vaccine in the next 12 months would be” with extremely difficult–extremely easy endpoints. To assess controllability, respondents were asked to report whether performing the behavior is in their control or due to factors beyond their control. One sample item was, “How much control do you have to get all three doses of HPV vaccine in the next 12 months?” with no control–complete control as endpoints. Six items were used to assess this construct (items 15, 16, 17, 18, 19, 20). A range of scores from 6 to 42 was possible. The overall construct score was determined by calculating the mean of the item scores. Higher scores indicated greater perceived control over getting all three doses of the HPV vaccine in the next 12 months.
Demographic and descriptive items. The final section of the instrument assessed demographic and descriptive information about the sample. Structured multiple choice items were used to obtain information about HPV awareness, HPV vaccine awareness, biological sex, age, relationship status, marital status, sexual intercourse history, ethnicity, year in school, oral sex in past 30 days, vaginal sex in past 30 days, and anal sex in past 30 days. Structured hybrid items were used to collect information about sexual orientation, race, and primary source of health insurance. Numeric fill-in-the-blank items were utilized to obtain information about number of lifetime oral sex partners, number of lifetime vaginal sexual partners, number of lifetime anal sex partners, number of oral sex partners in last 12 months, number of vaginal sex partners in last 12 months, and number of anal sex partners in last 12 months.

For sexual orientation (item 27), the following categories were available: heterosexual or straight, gay or lesbian, bisexual, asexual, and other. Respondents had the option of writing/typing a response in for the ‘other’ sexual orientation category. Prior to all sexual behavior questions, the following definitions were provided for respondents: “Oral sex means mouth on a penis, vagina, or anus (butt); Vaginal sex means penis in vagina; Anal sex means penis in anus (butt)”.

To determine whether respondents had ever engaged in sexual activity (item 28), respondents were asked, “Have you ever engaged in any of the following sexual activities: oral sex, vaginal sex, and/or anal sex?” This item includes two response options: yes or no. All of the items regarding number of sexual partners in one’s lifetime (items 29, 30, 31) and the last 12 months (items 32, 33, 34) were based on item 19 from the NCHA II survey. Respondents were asked to write/type the number of sexual partners they had within this timeframe, in the box below the respective item. Respondents who had never engaged in the given behavior were given the option to write/type “0” as their response. Three categorical
questions (items 35, 36, 37) asked participants whether they had engaged in oral, vaginal, or anal sex in the last 30 days, respectively, and were adapted from item 21 on the NCHA II survey. These items included the following response options: yes; no–have never engaged in this sexual activity; or no–have done this activity in the past but not in the past 30 days.

For the ethnicity question (item 38), respondents self-reported as Hispanic or Non-Hispanic, categories that were based on the United States Census Bureau’s (2010) Census form. For race (item 39), the following categories were available as options: African American/Black, Asian, Caucasian/White, American Indian/Alaska Native, Native Hawaiian/Pacific Islander, more than one race, and other. Racial categories were also based on the 2010 Census form. Respondents had the option of writing/typing a response in for the ‘other’ race category. For the year in school question (item 40), the following options were available: 1st year undergraduate, 2nd year undergraduate, 3rd year undergraduate, 4th year undergraduate, 5th year or more undergraduate, graduate, and other. Respondents had the option of writing/typing a response in the box for the ‘other’ category. For primary source of health insurance (item 41), the following options were available: my college/university sponsored plan; my parents’/guardians’ plan; another plan; I don’t have health insurance; and I am not sure if I have health insurance. Respondents had the option of writing/typing a response in the box for the ‘another plan’ source of health insurance category. The primary source of health insurance item was based on item 62 from the NCHA II survey. The data collected in section two was used to characterize the sample and was not specific enough to identify individual respondents.

In combining sections one and two, the entire quantitative instrument was comprised of 41 items (See Appendix J for the electronic instrument). A pilot instrument was also constructed, which was identical to quantitative instrument, except for the instructions to respondents and
four open-ended questions regarding the clarity of the directions and items, ease of the layout, and overall suggestions to improve the questionnaire. The instructions for pilot respondents were as follows, “Before proceeding to section 1, please flip to page 5 and read questions 42–45. As you complete the questionnaire, please encircle any words or questions that are unclear or do not make sense to you. Please feel free to write your comments anywhere on the questionnaire.”

To assess readability and comprehensibility, the following questions were included on the questionnaire, “Are the directions clear and concise? If not, please write alternatives or suggestions here”; “Are the questions easy to understand? If not, please list which questions were difficult to understand and write suggestions for improvement here”; “Is the layout clear and easy to use for answering the questions? If not, please write suggestions for improvement here”; and “Please provide any additional comments or suggestions on how to improve the questionnaire here.”

**Pilot test quantitative instrument. Overview.** Permission to conduct the pilot test, test-retest, and primary quantitative study was granted by The University of Alabama IRB in December 2014 (See Appendix K). The instrument was pilot tested with a small sample of the priority population for readability, comprehensibility, and time requirements. A sample size of five or more respondents from the priority population is recommended for piloting a TPB instrument (Ajzen, 2006a; Francis et al., 2004). Therefore, a sample size of seven college males was sought for the pilot test. For practical purposes, pilot study participants were recruited from students enrolled in one face-to-face Personal Health course and one face-to-face Community and Public Health course offered in CHES. The PI e-mailed course instructors to ask them to volunteer class time. The e-mail provided an overview of the study and its time requirements. The e-mail also requested that instructors offer up to five bonus points for students’ participation.
in the study or completion of the alternative activity. Estimated time to complete the pilot instrument was set at 25 minutes.

**Data collection.** The PI invited students within classes volunteered by their respective Community and Public Health or Personal Health instructor to participate in the pilot study. Students were recruited from one Community and Public Health and one Personal Health course within CHES during Spring 2015. Upon entering the classroom, the PI introduced herself to the class, and asked the instructor to leave the room during the study recruitment and administration process. Once the instructor exited the classroom, the PI provided some background information, and explained the purpose of the study along with its inclusion criteria. The PI used PowerPoint slides to reinforce the information. The PI gave each willing student a packet, which included an information sheet for research, an extra credit form, and a pilot instrument.

The information sheet for research provided details about the study, including its purpose, benefits and risks to participants, procedures for maintaining confidentiality, participants’ rights, and alternatives to participating (See Appendix L). The PI read each section of the information sheet to potential participants and reinforced that their participation in the study was confidential and voluntary. Next, the PI gave students time to review the information sheet independently and to ask questions about the study. All potential study participants were made aware that completing the instrument indicated their consent for their responses to be used for research. The participants were asked to remove the information sheet for research from the packet and keep it for their personal records. Participants were informed that they should complete the extra credit form if they wished to receive extra credit points for their participation in the study. The extra credit form requested that students provide their first and last name, course prefix and number, course section, and instructor name.
Students were verbally and visually prompted to review the instructions on the first page of the instrument and the corresponding questions on the last page before completing the instrument. Students who did not wish to participate in the study or did not meet inclusion criteria were given the option to complete a time-equivalent, incentive-equivalent alternative activity. The alternative activity involved reviewing a handout on hookah use, and answering 16 multiple choice and fill-in-the-blank questions (See Appendix M). At the end of the informational period, the investigator gave the students approximately 25 minutes to complete the pilot instrument. At the end of the time, the PI asked students to turn their completed instruments over. The PI picked up the instruments, and placed them into a concealed envelope. Next, the PI collected the extra credit sheets and placed them into a separate concealed envelope. Then the PI collected the alternative activity answer sheets and placed them into a separate concealed envelope. After all papers were collected, the PI thanked the class for their time and asked the instructor to come back into the classroom. Once the instructor re-entered the classroom, the PI left with the envelopes.

**Data analysis.** Across the two classes that participated, 19 males (14 in one class, 5 in the other class) were present in class on the dates of the pilot study; of those, 7 eligible males participated in the pilot test of the quantitative instrument. Once an adequate sample size was secured, the PI reviewed each completed pilot instrument, with careful consideration given to the feedback provided for the open-ended readability and comprehensibility items. The PI also assessed each completed instrument for words or phrases that had been circled and comments that had been written on the instrument. The feedback from the pilot test respondents indicated that the items were readable and comprehensible for college males. The suggestions that were provided by pilot test participants contradicted Ajzen’s recommendations for TPB instruments or
had been conducted in previous phases of the instrumentation process; thus, their suggestions were not incorporated into the instrument. A summary of the feedback from the pilot study participants is provided in Table 3.4. The dissertation committee co-chairs confirmed that the instrument did not require any modifications based on the pilot test results.

The pilot sample was comprised of Non-Hispanic (100%), African-American/Black (42.9%) or Caucasian/White (57.1%), heterosexual (100%), male students, whose primary source of health insurance was their parents’/guardians’ plan (100%). Pilot participants’ ages ranged from 20–23 years (100%) and more than half were fourth year undergraduates (57.1%). All of the respondents were single, never married (100%), though nearly half (42.9%) were in a relationship but not living together. Nearly three quarters (71.4%) of participants reported having ever engaged in oral, vaginal, or anal sex. All of the respondents (100%) indicated that they heard about HPV before they were invited to participate in this study. However, only 71% of participants had heard about the vaccine for HPV before they were invited to participate in the study.
Table 3.4

Summary of Pilot Test for Quantitative TPB Instrument ($N = 7$)

<table>
<thead>
<tr>
<th>Question</th>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are the directions clear and concise? If not, please write alternatives</td>
<td>• Directions are clear and concise</td>
</tr>
<tr>
<td>or suggestions here.</td>
<td>• Yes ($n = 5$)</td>
</tr>
<tr>
<td>Are the questions easy to understand? If not, please list which questions</td>
<td>• I understand all questions</td>
</tr>
<tr>
<td>were difficult to understand and write suggestions for improvement here.</td>
<td>• Yes ($n = 5$)</td>
</tr>
<tr>
<td>Is the layout clear and easy to use for answering the questions? If not,</td>
<td>• Yes ($n = 4$)</td>
</tr>
<tr>
<td>please write suggestions for improvement here.</td>
<td>• The number scale 1-7 seems a little odd, 1-5 or 1-10 would seem like a</td>
</tr>
<tr>
<td></td>
<td>more clear option</td>
</tr>
<tr>
<td></td>
<td>• I do not like rating scales. Too much to select from. The difference</td>
</tr>
<tr>
<td></td>
<td>between a 4 and a 5 may not be a big deal to me but to you could mean</td>
</tr>
<tr>
<td></td>
<td>a lot.</td>
</tr>
<tr>
<td>Please provide additional comments or suggestions on how to improve the</td>
<td>• Learned about a new vaccine</td>
</tr>
<tr>
<td>questionnaire here:</td>
<td>• Don’t put as many numbers to answer a question. It doesn’t seem to</td>
</tr>
<tr>
<td></td>
<td>give an accurate statistic</td>
</tr>
<tr>
<td></td>
<td>• I thought it was straightforward and easy to understand</td>
</tr>
<tr>
<td></td>
<td>• N/A</td>
</tr>
</tbody>
</table>

**Test-retest quantitative instrument. Overview.** Stability of the instrument was tested using a test-retest procedure. The time between instrument administrations was set at one to two weeks (Nunnally & Bernstein, 1994; Rust & Golombok, 2009). The test-retest sample size ($N = 30$) was determined based on convention of at least 30 participants, which is the minimum sample size necessary to detect a statistically significant relationship (Gay, 1992; Sharma & Petosa, 2014). However, in order to account for attrition the sample size was set at approximately 60. Pearson’s $r$ correlation was employed to assess stability reliability (Sharma & Petosa, 2014). Test-retest reliability correlation coefficients were set *a priori* at 0.70 (Polit et al., 2004).
Test-retest participants were recruited from three Business Communications and two Drug Awareness Education courses. The PI contacted the course instructors via e-mail and requested their permission to conduct the study. Instructors were provided with an overview of the research study, time requirements, and alternatives for students who did not wish to participate, had already participated, or did not qualify for the study. The e-mail also requested that instructors offer up to five bonus points for students’ participation in the study or completion of the alternative activity. Estimated time to complete the instrument was set at 20 minutes.

Data collection. A total of approximately 60 participants were sought for test-retest. The PI invited students within classes volunteered by their respective instructor to participate in test-retest. Students were recruited from Business Communications and Drug Awareness Education courses during Spring 2015. Test-retest results were used exclusively to determine the stability reliability of the instrument, and were not incorporated into the construct or predictive validity analyses.

Upon entering the classroom, the PI introduced herself to the class and provided a brief biographical sketch. Prior to study recruitment, the investigator asked the instructor to stand outside the classroom during the study recruitment and administration process. Once the instructor had exited the classroom, the PI verbally explained the purpose of the study and its inclusion criteria. This information was reinforced with PowerPoint slides. The PI gave each willing student a packet, which included an information sheet for research, an extra credit form, and a test-retest instrument.

The information sheet for research provided details about the study, including its purpose, benefits and risks to participants, procedures for maintaining confidentiality, participants’ rights, and alternatives to participating (See Appendix L). The PI read each section of the information
sheet to potential participants and reinforced that their participation in the study was confidential and voluntary. Next, the PI gave students time to review the information sheet independently and ask questions about the study. All potential study participants were made aware that completing the instrument indicated their consent for their responses to be used for research. The participants were asked to remove the information sheet for research from the packet and keep it for their personal records. Next, the PI requested that participants create a four digit identification number that they would remember, and to write it in the appropriate box in the top right hand corner of the instrument. The PI explained that the number would be used to track their responses over time. The PI encouraged respondents to use the last four digits of their cell phone number, or another number they were familiar with so that they could remember the number at the re-test administration. However, participants were able to use any number that they felt comfortable disclosing. Participants were informed that they should complete the extra credit form if they wished to receive extra credit points for their participation in the study. The extra credit form requested that students provide their first and last name, course prefix and number, course section, and instructor name. Participants were only asked to complete this form during the test administration process.

Students who did not wish to participate in the study, did not meet inclusion criteria, or had previously taken the questionnaire had the opportunity to complete a time-equivalent and incentive-equivalent alternative activity. For the test administration, the alternative activity involved reviewing a handout on hookah use, and answering 16 multiple choice, true/false, and fill-in-the-blank questions (See Appendix M). At the end of the informational period, the investigator gave the students approximately 20 minutes to complete the instrument. At the end of the time, the PI asked students to turn their completed instruments over. The PI picked up the
instruments, and placed them into a concealed envelope. Next, the PI collected the extra credit sheets and placed them into a separate concealed envelope. Then, the PI collected the alternative activity answer sheets and placed them into a separate concealed envelope. After all papers were collected, the PI thanked the class for their time and asked the instructor to come back into the classroom. Once the instructor re-entered the classroom, the PI left with the envelopes. The PI re-entered the classroom approximately one to two weeks later to perform the same procedures for the retest portion, except the information sheet was not reviewed again. Students who completed the first alternative activity about hookah use were given the option to read an article about interventions to prevent hookah use and answer 15 multiple choice and fill-in-the-blank questions (See Appendix N).

**Data analysis.** Male students from a total of five Business Communications and Drug Awareness Education courses were invited to participate in the study. In total, 83 males were present in class on the dates that the test administration took place; of those, 69 eligible males participated in the test administration. Of those who participated in the test administration of the instrument, 59 participated in the retest administration. Test-retest data was analyzed using International Business Machines (IBM®) Statistical Package for Social Sciences (SPSS), Statistics version 22.0. Descriptive statistics were used to describe the characteristics of the sample. A summary of the demographic characteristics of the test-retest sample is included in Table 3.5. All of the TPB constructs were normally distributed for time 1 and time 2; therefore, Pearson’s correlation coefficients were employed to evaluate the stability of the instrument. Attitude toward the behavior \( r (59) = 0.848, p < .01 \), subjective norm \( r (59) = 0.897, p < .01 \), and perceived behavioral control \( r (59) = 0.879, p < .01 \) constructs met the *a priori* test-retest reliability correlation coefficient criteria of 0.70. Although the behavioral intention construct \( r (59) =
0.692, \( p < .01 \) did not meet the \textit{a priori} criteria, it was deemed acceptable because it was a new scale and was within one hundredth of a point from the criteria (Bowling, 2005, p. 397). A summary of the sexual behavior frequency statistics of the sample in the last 30 days is presented in Table 3.6. The mean, standard deviation, possible range, and observed range for number of oral, vaginal, and anal sexual partners in the last 12 months and over the lifetime for the sample are summarized in Table 3.7.

Table 3.5

\textit{Summary of Demographic Frequency Statistics for Test-Retest Sample (N = 59)}

\begin{center}
\begin{tabular}{lcc}
\hline
Variable & \( n \) & \% \\
\hline
Age & & \\
18 & 0 & 0.0 \\
19 & 3 & 5.1 \\
20 & 12 & 20.3 \\
21 & 28 & 47.5 \\
22 & 13 & 22.0 \\
23 & 1 & 1.7 \\
24 & 1 & 1.7 \\
25 & 1 & 1.7 \\
26 & 0 & 0.0 \\
Academic Status & & \\
First year undergraduate & 0 & 0.0 \\
Second year undergraduate & 4 & 6.8 \\
Third year undergraduate & 36 & 61.0 \\
Fourth year undergraduate & 15 & 25.4 \\
Fifth year or more undergraduate & 4 & 6.8 \\
Ethnicity & & \\
Hispanic & 1 & 1.7 \\
Non-Hispanic & 58 & 98.3 \\
Race & & \\
African American/Black & 2 & 3.4 \\
Asian & 4 & 6.8 \\
Caucasian/White & 51 & 86.4 \\
More than one race & 2 & 3.4 \\
Other & 0 & 0.0 \\
\hline
\end{tabular}
\end{center}
Sexual Orientation
- Heterosexual or straight: 59 (100.0)
- Gay: 0 (0.0)
- Bisexual: 0 (0.0)
- Asexual: 0 (0.0)
- Other: 0 (0.0)

Marital Status
- Single, never married: 58 (98.3)
- Married: 1 (1.7)
- Separated: 0 (0.0)
- Divorced: 0 (0.0)
- Widower: 0 (0.0)

Relationship Status
- Not in a relationship: 38 (64.4)
- In a relationship but not living together: 18 (30.5)
- In a relationship and living together: 3 (5.1)

HPV Awareness*
- Yes: 40 (67.8)
- No: 19 (32.2)

HPV Vaccine Awareness**
- Yes: 30 (50.8)
- No: 29 (49.2)

Source of Health Insurance
- My college/university sponsored plan: 2 (3.4)
- My parents'/guardians’ plan: 53 (89.8)
- Another plan: 0 (0.0)
- I don’t have health insurance: 3 (5.1)
- I am not sure if I have health insurance: 1 (1.7)

Note. *HPV awareness was assessed by asking respondents, “Before you were invited to participate in this study, had you heard about human papillomavirus (HPV)? **HPV vaccine awareness was assessed by asking respondents, “Before you were invited to participate in this study, had you heard about the vaccine for human papillomavirus?”

Table 3.6

Summary of Sexual Behavior Frequency Statistics for Test-Retest Sample (N = 59)

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sexual History*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>50</td>
<td>84.7</td>
</tr>
<tr>
<td>No</td>
<td>9</td>
<td>15.3</td>
</tr>
<tr>
<td>Oral Sex in Past 30 Days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>35</td>
<td>59.3</td>
</tr>
<tr>
<td>No, have engaged in this sexual activity in the past, but not in the past 30 days</td>
<td>15</td>
<td>25.4</td>
</tr>
<tr>
<td>No, have never engaged in this sexual activity</td>
<td>9</td>
<td>15.3</td>
</tr>
</tbody>
</table>
Vaginal Sex in Past 30 Days
  Yes 32  54.2
  No, have engaged in this sexual activity in the past, but not in the past 30 days 14  23.7
  No, have never engaged in this sexual activity 13  22.0

Anal Sex in Past 30 Days
  Yes 0  0.0
  No, have engaged in this sexual activity in the past, but not in the past 30 days 46  78.0
  No, have never engaged in this sexual activity 13  22.0

*Sexual history was assessed by asking respondents, “Have you ever engaged in any of the following sexual activities: oral sex, vaginal sex, and/or anal sex?”

Table 3.7

Summary of Number of Oral, Vaginal, and Anal Sexual Partners in Last 12 Months and Lifetime for Test-Retest Sample (N = 59)

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>Mdn</th>
<th>SD</th>
<th>Possible Range</th>
<th>Observed Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifetime Oral Sex Partners</td>
<td>8.24</td>
<td>5.0</td>
<td>11.11</td>
<td>0 – 99</td>
<td>0 – 60</td>
</tr>
<tr>
<td>Lifetime Vaginal Sex Partners</td>
<td>8.00</td>
<td>5.0</td>
<td>14.15</td>
<td>0 – 99</td>
<td>0 – 99</td>
</tr>
<tr>
<td>Lifetime Anal Sex Partners</td>
<td>0.34</td>
<td>0.0</td>
<td>1.35</td>
<td>0 – 99</td>
<td>0 – 10</td>
</tr>
<tr>
<td>Last 12 Months Oral Sex Partners</td>
<td>2.76</td>
<td>2.0</td>
<td>4.32</td>
<td>0 – 99</td>
<td>0 – 30</td>
</tr>
<tr>
<td>Last 12 Months Vaginal Sex Partners</td>
<td>2.83</td>
<td>2.0</td>
<td>3.70</td>
<td>0 – 99</td>
<td>0 – 20</td>
</tr>
<tr>
<td>Last 12 Months Anal Sex Partners</td>
<td>0.19</td>
<td>0.0</td>
<td>0.60</td>
<td>0 – 99</td>
<td>0 – 4</td>
</tr>
</tbody>
</table>

Primary data collection. Overview. Participants were recruited from Business Communications; Lifespan Human Development; Principles and Foundations of Health Promotion; Introduction to Human Nutrition; Purchasing Design Risk Management Food Service; First Aid, Safety, and CPR; Introduction to Athletic Training; Community and Public Health; and Drug Awareness Education. The PI contacted the course instructors via e-mail and requested their permission to conduct the online study. Instructors were provided with an overview of the research study, time requirements, and alternatives for students who did not wish to participate, did not qualify, or had previously participated in the study. The e-mail also requested that instructors offer up to five bonus points for students’ participation in the study or
completion of the alternative activity. Estimated time to complete the online instrument was set at 20 minutes.

The PI targeted a convenience sample of approximately 250 college males. The rule of thumb with sample size in traditional multivariate analyses is 20 subjects per variable (Schumacker & Lomax, 2010). However, there is no rule of thumb with structural equation modeling (SEM); sample size recommendations “vary from 100, 200, to 500 subjects per study, depending on model complexity and cross-validation requirements” (Schumacker & Lomax, 2010, p. 211). While there is no standard sample size requirement for SEM, 200 cases provide adequate statistical power for data analysis and, subsequently are sufficient to test the predictive validity of the proposed model (Garver & Mentzer, 1999; Hoe, 2008; Hoelter, 1983).

**Mode.** The instrument was delivered electronically to the sample via Qualtrics™, which is an online, fee-based survey platform that assists subscribers in creating and publishing web-based surveys (Qualtrics, LLC., 2014).

The PI took several steps to address primary barriers associated with electronic questionnaires. To address the issue of access to e-mail addresses, the PI requested that willing instructors forward the study invitation e-mail message to students enrolled in their respective courses. The researcher assumed that having instructors forward the recruitment invitation would increase students’ perception of the message’s credibility, which should have increased the probability that students read the e-mail. To improve the perception of personalization, the researcher constructed a cover letter that informed potential participants of the importance of the study in developing HPV and HPV vaccination educational interventions to increase HPV vaccine uptake. The first sentence of the cover letter explained that the researcher was a student at UA, which was assumed to decrease students’ perception of the e-mail as junk mail. In
addition to the cover letter, the e-mail message included a portable document format (PDF) attachment with information about the study. The researcher requested to attend the classes of willing instructors to provide background information about the study and its online procedures; however, this was not required for students to be able to participate in the online study. The purpose of attending the classes was to introduce the study, answer any related questions, and reach students who would not otherwise have read the invitation e-mail.

**Delivery. Instrument administration.** The final version of the instrument was programmed into Qualtrics™. The researcher selected several pre-set options for online administration of the instrument. The PI set the instrument default to allow the program to track each respondent’s progress throughout the questionnaire. Consequently, respondents were able to answer questions at their leisure, save their responses, and complete the remaining questions later. A progress bar with the percentage of the questionnaire completed was displayed at the top of each page of the online questionnaire. For security purposes, a tag was added to the instrument to prevent search engines from indexing the questionnaire. To prevent respondents from completing the instrument more than once, the PI opted to prevent ballot box stuffing. To increase the reliability of the results, the instrument was pre-set to include a back option, which allowed respondents to change their responses. Consequently, participants were able to review their responses to ensure that they selected the response(s) that they intended to choose.

One primary advantage of Web-based questionnaires is the ability to request responses to all questions. Validation criteria were employed to prompt responses to any unanswered item(s) before proceeding to the next page of the instrument. If a participant skipped a question they received the following pop-up message: “There is 1 (varied depending on number of unanswered questions on the page) unanswered question on this page. Would you like to continue?” At the
bottom of the pop-up box participants were prompted to select “continue without answering” or “answer the question,” but they were unable to proceed with the questionnaire until they had selected an option. Regardless, participants had the ability to skip any item that they did not want to answer. The PI assumed that this validation criterion prevented respondents from mistakenly skipping questions. Validation criteria were also applied to items that prompted written responses to help ensure that viable responses were provided. For example, respondents were limited to the number of sexual partners they could report having in the last 12 months (0–99). For example, if a participant entered that they had 1,000 oral sex partners in the last 12 months, the following message would have appeared on the screen in red text above the question: “The value must be less than or equal to 99.” Participants were unable to proceed with the questionnaire unless they changed the value to 99 or less, or deleted their response and chose not to answer the question.

Participant eligibility. A series of logic questions were employed to determine students’ eligibility to participate in the study. For the purposes of this study, the priority population was comprised of undergraduate male students between the ages of 18 and 26, who had not received any doses of the HPV vaccine. The first screening question was, “Are you under 18 years of age?” Respondents who answered “yes” were not eligible to participate in the study and were redirected to the alternative activity. The second screening question was, “Are you over 26 years of age?” Respondents who answered “yes” were not eligible to participate in the study and were redirected to the alternative activity. The third screening question was “Have you received any doses (shots) of the human papillomavirus (HPV) vaccine?” Respondents who answered “yes” were not eligible to participate in the study and were redirected to the alternative activity. Once
eligibility was determined, students who qualified for the study were given the option to participate in the study or the alternative activity.

**Consent procedures.** Students who chose to participate in the study were directed to a page that displayed an information sheet for research. This sheet explained the study, including benefits, risks, participants’ rights, the voluntary nature of the study, and the option to withdraw from the study at any time. Participants were assured that the results would be held confidential and only group data would be presented for research purposes. The PI’s contact information was included on the information sheet. Participants were requested to contact the PI if any questions or concerns arose during data collection or after the questionnaire closed. All participants were required to indicate their understanding of the study terms and conditions by giving their consent before initiating the instrument. The following consent statement was displayed at the bottom of the information sheet, “By selecting yes below and completing the questionnaire, you indicate consent for your answers to be used in this research study.” Additionally, participants were prompted to print the information sheet for their records. Participant consent was validated through a forced response of “Yes, my confidential responses may be used for research purposes as described above” or “No, my confidential responses may not be used for research purposes as described above,” which was displayed underneath this statement. Respondents who selected the “no” option were forced to exit the questionnaire.

**Data collection.** A total of approximately 250 participants were sought for this phase. The PI e-mailed Business Communications; Lifespan Human Development; Principles and Foundations of Health Promotion; Introduction to Human Nutrition; Purchasing Design Risk Management Food Service; First Aid, Safety, and CPR; Introduction to Athletic Training; Community and Public Health; and Drug Awareness Education instructors (See Appendix O),
and requested that they forward a study invitation e-mail (See Appendix P) to students enrolled in their respective course(s). The e-mail for instructors provided an overview of the online phase of the study and alternatives to participating in the study. Additionally, instructors were requested to offer up to five bonus points for students’ participation in the study or completion of the alternative activity. Instructors who indicated their willingness to fulfill the request received the study invitation e-mail message to forward to their students. The researcher did not obtain student e-mail addresses. No additional incentives were provided to instructors who agreed to allow the investigators to recruit from their classrooms. The study invitation e-mail that was forwarded to students explained the study, inclusion criteria, benefits, risks for participation, and that participation is voluntary and confidential. The study invitation e-mail included one link that provided access to the questionnaire and alternative activity. The e-mail also explained the procedure for obtaining bonus points for their participation. A PowerPoint that was saved as a PDF provided an overview of the study and its online procedures was attached to the invitation e-mail. The slides in this file were identical to those that were presented to students enrolled in courses with instructors who allowed the PI to attend their class. Students who were interested in participating clicked on the link, which directed them to the page in Qualtrics\textsuperscript{TM}. Students selected that they were interested in participating in the study or completing the alternative activity, and answered screening questions. If participants qualified, they could choose to participate in the study, provide consent, and proceed until they had completed the questionnaire. If participants qualified for the study but chose to opt out, they were redirected to the alternative activity (See Appendix Q).

Once eligibility had been established and consent had been obtained, the respondent was prompted to initiate the electronic instrument. The electronic version of the instrument was
comprised of 41 questions. Twenty bipolar matrix-type items were employed to assess the TPB constructs. Twenty-one multiple choice and text entry question types were used to obtain demographic and descriptive information. Estimated time to complete the online instrument was set at 20 minutes. The electronic instrument was pre-coded to enable a smooth transition from the online platform to the data analysis software.

Data analyses. Data were analyzed using International Business Machines (IBM®) Statistical Package for Social Sciences (SPSS), Statistics version 22.0 and Analysis of Moment Structures (AMOS) data analysis software (Arbuckle, 2006). Descriptive statistics were used to describe the characteristics of the sample. Cronbach’s alpha was employed to assess internal consistency, which determines the extent to which each item on a scale relates to other items on that scale (Green & Lewis, 1986). A set of indicators is considered reliable when Cronbach’s alpha coefficients meet or exceed 0.70. In this case, indicators are combined into a single scale and operationalized as a construct. Bivariate correlation coefficients assessed the relationships between the TPB constructs and behavioral intention to get all three doses of the HPV vaccine in the next 12 months. The degree of association between correlations is typically given a qualitative label of weak ($|r| \leq 0.30$), moderate ($0.30 < |r| < 0.70$), or strong ($|r| > 0.70$) (Field, 2009).

Kline’s (2010) two-step modeling approach was employed to specify the TPB-based model. This approach posits that once the measurement model is validated and found to be an acceptable fit, the fit of the structural model is specified. Confirmatory factor analysis (CFA) using the maximum likelihood (ML) method was applied to establish construct validity, which “is the degree to which a measure correlates with other measures it is theoretically expected to correlate with” (Valente, 2002, p. 161) The ML method is the most common method to estimate
the parameters of a confirmatory factor model, and was employed to assess the construct validity of the proposed TPB model. One assumption of ML is that the data are continuous and meet normality requirements. Factor loading values less than 0.50 were considered for removal (Hair, Anderson, Tatham, & Black, 1995). Average variance extracted (AVE) by each of the constructs was set \textit{a priori} at no less than 0.60 and construct reliability was set at no less than 0.70 (Fornell & Larcker, 1981; Hoe, 2008). Using Microsoft Excel for Mac 2011, AVE percentages and construct reliabilities were manually computed by calculating formulas developed by Fornell and Larcker (1981). Model fit assesses the extent to which the sample variance-covariance data fit the specified model (Schumacker & Lomax 2010, p. 85). Model fit was assessed through the model Chi-square test ($\chi^2$), goodness-of-fit (GFI) index, normed fit index (NFI), and root mean square error of approximation (RMSEA), and Kline’s alternative (KA) (2010). Kline’s alternative (2010) is used as an alternative method to assess model fit, and is calculated as a ratio of a model’s $\chi^2$ value by its degrees of freedom; KA values less than 3 indicate good fit. Satisfactory goodness-of-fit indices for the specified model were set \textit{a priori} as a Chi-square value of $p > 0.05$, KA $< 3.00$, GFI index $> 0.90$, NFI $>.90$, and RMSEA $< 0.08$ (Schumacker & Lomax, 2010, p. 76). Once acceptable model-fit indices were satisfied for the measurement model, its predictive validity was assessed through structural equation modeling, applying the direct TPB constructs as exogenous variables and behavioral intention as the endogenous variable. A conceptual model of the instrumentation process is illustrated in Figure 2.

\textit{Missing data.} If respondents failed to select a response for any of the items on the electronic instrument, it was considered to be missing. If any respondent had any responses considered missing, their data was eliminated from the study.
Figure 3.1. Flow chart of the instrumentation methodology.
Summary

The methodology for this study was discussed in this chapter. Participants included a convenience sample of vaccine-eligible college males enrolled at a large public southeastern university.

The instrumentation process included constructing and piloting a TPB-based salient elicitation instrument, content analyzing results from the salient elicitation study for item generation, Flesch Reading Ease and Flesch-Kincaid Grade Level tests, validation by a panel of seven experts, internal consistency, test-retest, and confirmatory factor analysis. For test-retest reliability and internal consistency, Pearson product moment correlation coefficients and Cronbach’s alpha were set a priori at 0.70. CFA applying the ML method assessed construct validity. Chi-square, KA, GFI, NFI, and RMSEA fit indices were utilized to evaluate the fit of the measurement model and structural model. Results from the analyses are presented in Chapter 4, with a discussion of the findings following in Chapter 5.
CHAPTER 4

RESULTS

Human papillomavirus (HPV) infection is a salient public health issue that is linked to negative physical, mental, and social outcomes, and affects millions of Americans each year. HPV vaccination is presented as the most efficacious primary prevention strategy to reduce the burden of HPV-associated morbidity. The purpose of this study was to operationalize the direct constructs of the theory of planned behavior (TPB) to predict the HPV vaccination behavioral intentions of male undergraduate college students attending a large public southeastern university. The results of this study are presented in Chapter 4, including the demographic characteristics of the sample, theoretical construct analyses, and results from hypothesis testing.

Data Screening and Respondents

A total of 32 instructors were contacted for class recruitment, and 18 instructors gave the principal investigator (PI) permission to recruit students in 35 classes by forwarding the study invitation e-mail to their respective students. The sampling frame consisted of 1,470 students; however, the possibility of dual-enrollment across the courses was likely given that several classes were recruited within the College of Human Environmental Sciences. Unless otherwise specified, it should be noted that the numbers provided below include males and females; this is because females were recruited to participate in this study as part of a separate investigation and it was impossible to differentiate by biological sex for the initial screening and consent items.

In total, 923 students clicked on the link to the instrument, but 907 indicated that they were interested in participating in the study or alternative activity. Of those who indicated that
they were interested in participating in the study or alternative activity, a total of 260 were not eligible to participate in the study because they were under 18 years of age (3.5%; \( n = 32 \)), over 26 years of age (1.3%; \( n = 11 \)), or had already received one or more doses of the HPV vaccine (25.4%; \( n = 217 \)). A total of 634 respondents (68.7%) were eligible to participate in the study; of those, 587 (92.6%) opted to complete the instrument. Of those who opted to complete the instrument after meeting eligibility requirements, 574 (99.1%) gave consent for their confidential responses to be used for research purposes. For the purpose of this study, any respondent who did not complete the item regarding biological sex and did not identify as male, was removed from further analyses. A total of 260 respondents identified as male; however, four of those cases were excluded from analyses because the respondents did not complete all of the instrument items. Consequently, the final sample consisted of 256 undergraduate males. The overarching response rate for participation in the study or the alternative activity was 53.6%. The exact response rate for males is unknown because the PI did not have access to the biological sex of all potential respondents.

**Demographic Characteristics of the Sample**

The sample (\( N = 256 \)) was comprised of mainly Non-Hispanic (96.1%; \( n = 246 \)), Caucasian/White (78.9%; \( n = 202 \)), heterosexual (98.4%; \( n = 252 \)), third year undergraduate (50.4%; \( n = 129 \)) males. Further, the mean age was 20.91 (±1.43). The sample was predominantly single, never married (\( n = 254 \), 99.2%), and over half reported not being in a relationship (52.7%; \( n = 135 \)). The majority of the sample received health insurance through their parents’/guardian’s health insurance plan (87.1%; \( n = 223 \)). Approximately one third (31.3%; \( n = 80 \)) of the sample had never heard of HPV before participating in the study, and nearly half (45.3%; \( n = 116 \)) had never heard of the HPV vaccine before participating in the study. The
majority (86.3%; \( n = 221 \)) reported having ever engaged in oral, vaginal, or anal sex. The sample reported an average of 6–7 lifetime oral sex partners, and approximately 2 oral sex partners in the past 12 months. Over half (54.7%; \( n = 140 \)) of the sample reported having engaged in oral sex in the past 30 days. The sample reported an average of 5–6 lifetime vaginal sex partners, and approximately 1–2 vaginal sex partners in the past 12 months. More than half (55.5%; \( n = 142 \)) of the sample reported engaging in vaginal sex in the past 30 days. Only 4.3% (\( n = 11 \)) of the sample reported engaging in anal sex in the past 30 days. A summary of the demographic frequency statistics for the primary sample is included in Table 4.1. The number of oral, vaginal, and anal sexual partners the primary sample reported in the last 12 months and in their lifetime is summarized in Table 4.2. A summary of the frequency statistics for engagement in oral, anal, or vaginal sex during one’s lifetime and within the last 30 days among the primary sample is provided in Table 4.3.

Table 4.1

<p>| Summary of Demographic Frequency Statistics for the Primary Sample (( N = 256 )) |
|---------------------------------|---------|--------|
| Variable                        | ( n ) | %      |
| Age                             |         |        |
| 18                              | 9       | 3.5    |
| 19                              | 28      | 10.9   |
| 20                              | 57      | 22.3   |
| 21                              | 93      | 36.3   |
| 22                              | 42      | 16.4   |
| 23                              | 15      | 5.9    |
| 24                              | 7       | 2.7    |
| 25                              | 2       | 0.8    |
| 26                              | 3       | 1.2    |
| Year in School                  |         |        |
| First year undergraduate        | 27      | 10.5   |
| Second year undergraduate       | 38      | 14.8   |
| Third year undergraduate        | 129     | 50.4   |
| Fourth year undergraduate       | 47      | 18.4   |
| Fifth year or more undergraduate| 15      | 5.9    |</p>
<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hispanic</td>
<td>10</td>
<td>3.9</td>
</tr>
<tr>
<td>Non-Hispanic</td>
<td>246</td>
<td>96.1</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American/Black</td>
<td>25</td>
<td>9.8</td>
</tr>
<tr>
<td>American Indian/Alaska Native</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Asian</td>
<td>16</td>
<td>6.3</td>
</tr>
<tr>
<td>Caucasian/White</td>
<td>202</td>
<td>78.9</td>
</tr>
<tr>
<td>Native Hawaiian/Pacific Islander</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>More than one race</td>
<td>9</td>
<td>3.5</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>1.6</td>
</tr>
<tr>
<td>Sexual Orientation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heterosexual or straight</td>
<td>252</td>
<td>98.4</td>
</tr>
<tr>
<td>Gay</td>
<td>2</td>
<td>0.8</td>
</tr>
<tr>
<td>Bisexual</td>
<td>2</td>
<td>0.8</td>
</tr>
<tr>
<td>Asexual</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single, never married</td>
<td>254</td>
<td>99.2</td>
</tr>
<tr>
<td>Married</td>
<td>2</td>
<td>0.8</td>
</tr>
<tr>
<td>Separated</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Divorced</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Widower</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Relationship Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not in a relationship</td>
<td>135</td>
<td>52.7</td>
</tr>
<tr>
<td>In a relationship but not living together</td>
<td>105</td>
<td>41.0</td>
</tr>
<tr>
<td>In a relationship and living together</td>
<td>16</td>
<td>6.3</td>
</tr>
<tr>
<td>HPV Awareness*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>176</td>
<td>68.8</td>
</tr>
<tr>
<td>No</td>
<td>80</td>
<td>31.3</td>
</tr>
<tr>
<td>HPV Vaccine Awareness**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>140</td>
<td>54.7</td>
</tr>
<tr>
<td>No</td>
<td>116</td>
<td>45.3</td>
</tr>
<tr>
<td>Source of Health Insurance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My college/university sponsored plan</td>
<td>19</td>
<td>7.4</td>
</tr>
<tr>
<td>My parents’/guardians’ plan</td>
<td>223</td>
<td>87.1</td>
</tr>
<tr>
<td>Another plan</td>
<td>5</td>
<td>2.0</td>
</tr>
<tr>
<td>I am not sure if I have health insurance</td>
<td>6</td>
<td>2.3</td>
</tr>
<tr>
<td>I don’t have health insurance</td>
<td>3</td>
<td>1.2</td>
</tr>
</tbody>
</table>

*HPV awareness was assessed by asking respondents, “Before you were invited to participate in this study, had you heard about human papillomavirus (HPV)? **HPV vaccine awareness was assessed by asking respondents, “Before you were invited to participate in this study, had you heard about the vaccine for human papillomavirus?”
Table 4.2

Summary of Number of Oral, Vaginal, and Anal Sexual Partners in Last 12 Months and Lifetime for the Primary Sample (N = 256)

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>Mdn</th>
<th>SD</th>
<th>Possible Range</th>
<th>Observed Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifetime Oral Sex Partners</td>
<td>6.72</td>
<td>4.00</td>
<td>10.03</td>
<td>0 – 99</td>
<td>0 – 98</td>
</tr>
<tr>
<td>Lifetime Vaginal Sex Partners</td>
<td>5.75</td>
<td>3.00</td>
<td>6.58</td>
<td>0 – 99</td>
<td>0 – 32</td>
</tr>
<tr>
<td>Lifetime Anal Sex Partners</td>
<td>0.66</td>
<td>0.00</td>
<td>2.83</td>
<td>0 – 99</td>
<td>0 – 30</td>
</tr>
<tr>
<td>Last 12 Months Oral Sex Partners</td>
<td>2.08</td>
<td>1.00</td>
<td>2.88</td>
<td>0 – 99</td>
<td>0 – 25</td>
</tr>
<tr>
<td>Last 12 Months Vaginal Sex Partners</td>
<td>1.87</td>
<td>1.00</td>
<td>2.43</td>
<td>0 – 99</td>
<td>0 – 16</td>
</tr>
<tr>
<td>Last 12 Months Anal Sex Partners</td>
<td>0.36</td>
<td>0.00</td>
<td>1.67</td>
<td>0 – 99</td>
<td>0 – 18</td>
</tr>
</tbody>
</table>

*Note.* The reported means and medians include respondents who indicated that they had 0 sexual partners for any of the selected behaviors.

Table 4.3

Summary of Sexual Behavior Frequency Statistics for the Primary Sample (N = 256)

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sexual History*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>221</td>
<td>86.3</td>
</tr>
<tr>
<td>No</td>
<td>35</td>
<td>13.7</td>
</tr>
<tr>
<td>Oral Sex in Past 30 Days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>140</td>
<td>54.7</td>
</tr>
<tr>
<td>No, have engaged in this sexual activity in the past, but not in the past 30 days</td>
<td>76</td>
<td>29.7</td>
</tr>
<tr>
<td>No, have never engaged in this sexual activity</td>
<td>40</td>
<td>15.6</td>
</tr>
<tr>
<td>Vaginal Sex in Past 30 Days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>142</td>
<td>55.5</td>
</tr>
<tr>
<td>No, have engaged in this sexual activity in the past, but not in the past 30 days</td>
<td>64</td>
<td>25.0</td>
</tr>
<tr>
<td>No, have never engaged in this sexual activity</td>
<td>50</td>
<td>19.5</td>
</tr>
<tr>
<td>Anal Sex in Past 30 Days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>11</td>
<td>4.3</td>
</tr>
<tr>
<td>No, have engaged in this sexual activity in the past, but not in the past 30 days</td>
<td>52</td>
<td>20.3</td>
</tr>
<tr>
<td>No, have never engaged in this sexual activity</td>
<td>193</td>
<td>75.4</td>
</tr>
</tbody>
</table>

*Note.* *Sexual history was assessed by asking respondents, “Have you ever engaged in any of the following sexual activities: oral sex, vaginal sex, and/or anal sex?”
Theoretical Construct Analyses

Descriptive statistics for exogenous and endogenous variables.

Attitude toward the behavior. A summary of the mean, standard deviation, possible range, and observed range for the attitude toward the behavior subscale is included in Table 4.4. Attitude toward the behavior was assessed through seven items (items 4, 5, 6, 7, 8, 9, 10) applying a 7-point semantic differential scale. The attitude toward the behavior construct had a possible range of 7 to 49 with higher scores indicating a more positive attitude toward getting all three doses of the HPV vaccine in the next 12 months. The observed range for the construct was 7 to 49 with a mean of 30.78 and a standard deviation of 9.50. The attitude toward the behavior construct appears normally distributed, with a skewness of -0.54 and kurtosis of -0.29. These values and inspection of the histogram suggest that the attitude toward the behavior construct is normally distributed. A histogram with a superimposed normal curve of the attitude toward the behavior construct is illustrated in Figure 4.1.

Subjective norm. The mean, standard deviation, possible range, and observed range for the subjective norm subscale are summarized in Table 4.4. Subjective norm was assessed through four items (items 11, 12, 13, 14) applying a 7-point semantic differential scale. The subjective norm construct had a possible range of 4 to 28 with higher scores indicating more social pressure to get all three doses of the HPV vaccine in the next 12 months. The observed range for the construct was 4 to 28 with a mean of 11.61 and a standard deviation of 6.73. The subjective norm construct distribution has a skewness of 3.11 and kurtosis of -2.31. These values and inspection of the histogram suggested a platykurtic and positively skewed distribution with more observations below the mean than above the mean. A histogram with a superimposed normal curve of the subjective norm construct is illustrated in Figure 4.1.
Perceived behavioral control. A summary of the mean, standard deviation, possible range, and observed range for the perceived behavioral control subscale is included in Table 4.4. Perceived behavioral control was assessed through six items (items 15, 16, 17, 18, 19, 20) applying a 7-point semantic differential scale. The perceived behavioral construct had a possible range of 6 to 42 with higher scores indicating a greater level of control to get all three doses of the HPV vaccine in the next 12 months. The observed range for the construct was 6 to 42 with a mean of 29.69 and a standard deviation of 8.80. The perceived behavioral control construct has a skewness of -3.92 and kurtosis of -0.10. These values and inspection of the histogram suggested a negatively skewed distribution with more observations above the mean than below the mean. A histogram with a superimposed normal curve of the perceived behavioral control construct is illustrated in Figure 4.1.

Behavioral intention. The mean, standard deviation, possible range, and observed range for the behavioral intention subscale are summarized in Table 4.4. Behavioral intention was assessed through three items (items 1, 2, 3) applying a 7-point semantic differential scale. The behavioral intention construct had a possible range of 3 to 21 with higher scores indicating a greater intention to get all three doses of the HPV vaccine in the next 12 months. The observed range for the construct was 3 to 21 with a mean of 8.52 and a standard deviation of 5.30. The behavioral intention construct has a skewness of 4.78 and kurtosis of -1.25. These values and inspection of the histogram suggested a platykurtic and positively skewed distribution with more observations below the mean than above the mean. A histogram with a superimposed normal curve of the behavioral intention construct is illustrated in Figure 4.1
Figure 4.1. Histograms with normal distribution curves applied to attitude toward the behavior, subjective norm, perceived behavioral control, and behavioral intention constructs for the primary sample of undergraduate males (N = 256).
### Table 4.4

Ranges, Means, Standard Deviations, Cronbach’s Alpha Coefficients, and Test-Retest Correlation Coefficients for the Theory of Planned Behavior Constructs ($N = 256$)

<table>
<thead>
<tr>
<th>Construct</th>
<th>Possible Range</th>
<th>Observed Range</th>
<th>$M$</th>
<th>SD</th>
<th>Cronbach’s $\alpha$</th>
<th>Pearson’s $r^*$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral Intention</td>
<td>3 – 21</td>
<td>3 – 21</td>
<td>8.52</td>
<td>5.30</td>
<td>0.97</td>
<td>.692**</td>
</tr>
<tr>
<td>Attitude Toward the Behavior</td>
<td>7 – 49</td>
<td>7 – 49</td>
<td>30.78</td>
<td>9.50</td>
<td>0.92</td>
<td>.848**</td>
</tr>
<tr>
<td>Subjective Norm</td>
<td>4 – 28</td>
<td>4 – 28</td>
<td>11.61</td>
<td>6.73</td>
<td>0.96</td>
<td>.897**</td>
</tr>
<tr>
<td>Perceived Behavioral Control</td>
<td>6 – 42</td>
<td>6 – 42</td>
<td>29.69</td>
<td>8.80</td>
<td>0.92</td>
<td>.879**</td>
</tr>
</tbody>
</table>

*Note.* *Stability reliability was calculated with a sample of 59 vaccine-eligible undergraduate males using Pearson’s $r$.** *Correlation coefficient is significant at the $p < 0.01$ level.

### Hypotheses Testing

**Null hypothesis 1.** Attitude toward the behavior (ATT) will not have a significant relationship with behavioral intention (BI) to get all three doses of the HPV vaccine in the next 12 months among college males. A Pearson’s product-moment correlation assessed the relationship between attitude toward the behavior and behavioral intention to get all three doses of the HPV vaccine in the next 12 months. The analysis revealed a significant, positive moderate correlation with behavior intention ($r (254) = .490, p \leq .001$). Consequently, the attitude toward the behavior scale was retained for the measurement model.

**Null hypothesis 2.** Subjective norm (SN) will not have a significant relationship with behavioral intention (BI) to get all three doses of the HPV vaccine in the next 12 months among college males. A Pearson’s product-moment correlation assessed the relationship between subjective norm and behavioral intention to get all three doses of the HPV vaccine in the next 12 months. The analysis revealed a significant, positive strong correlation with behavior intention ($r$...
Null hypothesis 3. Perceived behavioral control (PBC) will not have a significant relationship with behavioral intention (BI) to get all three doses of the HPV vaccine in the next 12 months among college males. A Pearson’s product-moment correlation assessed the relationship between perceived behavioral control and behavioral intention to get all three doses of the HPV vaccine in the next 12 months. The analysis revealed a significant, positive weak correlation with behavior intention \( r (254) = .215, p < .001 \). Consequently, the perceived behavioral control scale was retained for the measurement model. A summary of the Pearson product-moment correlations for null hypotheses 1, 2, and 3 are presented in Table 4.5.

Table 4.5

<table>
<thead>
<tr>
<th>Constructs</th>
<th>4.</th>
<th>3.</th>
<th>2.</th>
<th>1.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Behavioral intention</td>
<td>.215**</td>
<td>.725**</td>
<td>.490**</td>
<td>–</td>
</tr>
<tr>
<td>2. Attitude toward the behavior</td>
<td>.446**</td>
<td>.481**</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>3. Subjective norm</td>
<td>.184*</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>4. Perceived behavioral control</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

Note. *p < .01. **p < .001

Null hypothesis 4. The constructs of attitude toward the behavior \((β_1)\), subjective norm \((β_2)\), and perceived behavioral control \((β_3)\) combined together will not significantly predict behavioral intention to get all three doses of the HPV vaccine in the next 12 months \((Y)\) among college males.

Kline’s (2010) two-step modeling approach was employed to specify the TPB-based model. This approach posits that once the measurement model is validated and found to be an acceptable fit, the fit of the structural model is specified.
Measurement model. Confirmatory factor analysis applying the Maximum Likelihood (ML) method was conducted to assess construct validity of the measurement model. Model fit was assessed through the model Chi-square test ($\chi^2$), Kline’s alternative (KA), goodness-of-fit index (GFI), normed fit index (NFI), and root mean square error of approximation (RMSEA). The initial measurement model indicated reasonable fit ($\chi^2 = 385.65, df = 164, p = .000; \text{KA} = 2.35; \text{GFI} = .870; \text{NFI} = .927; \text{RMSEA} = .073$). Co-varying errors within the attitude toward behavior, subjective norm, and perceived behavioral control constructs improved overall fit ($\chi^2 = 271.414, df = 155, p = .000; \text{KA} = 1.751; \text{GFI} = 0.907; \text{NFI} = 0.948; \text{RMSEA} = 0.054$).

Convergent validity examined the extent to which the model indicators of each construct converged adequately. Indicator factor loadings, construct reliability, internal consistency, and average variance extracted were calculated to assess convergent validity. Factor loadings for the attitude toward behavior construct were 0.86, 0.84, 0.68, 0.89, 0.92, 0.50, and 0.84, respectively, and met or exceeded the 0.50 a priori criteria. Factor loadings for the subjective norm construct were 0.93, 0.94, 0.96, and 0.90, and exceeded the 0.50 a priori criteria. Factor loadings for the perceived behavioral control construct were 0.74, 0.86, 0.83, 0.79, 0.82, and 0.80, respectively, and exceeded the 0.50 a priori criteria. Factor loadings for behavioral intention were 0.93, 0.97, and 0.95, respectively, and exceeded the 0.50 a priori criteria. Construct reliability values for the attitude toward behavior (0.92), subjective norm (0.96), perceived behavioral control (0.92), and behavioral intention (0.97) each exceeded the 0.70 a priori criteria. Average variance extracted for attitude toward behavior (64.3%), subjective norm (87.0%), perceived behavioral control (65.38%), and behavioral intention (90.5%) exceeded the a priori criteria of 60%. Internal consistency was assessed using Cronbach’s alpha. The attitude toward behavior (0.92), subjective norm (0.96), perceived behavioral control (0.92), and behavioral intention (0.97)
constructs each satisfied the 0.70 \textit{a priori} internal consistency criteria. The data provided support
for the convergent validity of the four-factor TPB model. The indicator factor loadings, construct
reliability, and percent of average variance extracted for each of the latent factors in the final
measurement model are provided in Table 4.5. An illustration with indicator factor loadings,
squared multiple correlations delineating the amount of variance each indicator provides on the
latent construct, and the beta-coefficients for correlations among latent factors are displayed in
Figure 4.2.

Table 4.6

\textit{Confirmatory Factor Analysis Applying Maximum Likelihood Method: Factor Loadings, Construct
Reliability, and Average Variance Extracted for Theory of Planned Behavior-based Constructs in
Sample of Undergraduate Males (N = 256).}

<table>
<thead>
<tr>
<th>Construct</th>
<th>Factor Loadings</th>
<th>Construct Reliability</th>
<th>AVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral Intention</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>\textit{1. Item 1.} I intend to get all three doses of the HPV vaccine in the next 12 months – Completely disagree–Completely agree</td>
<td>0.93</td>
<td></td>
<td></td>
</tr>
<tr>
<td>\textit{2. Item 2.} I will try to get all three doses of the HPV vaccines in the next 12 months – Completely disagree–Completely agree</td>
<td>0.97</td>
<td></td>
<td></td>
</tr>
<tr>
<td>\textit{3. Item 3.} I plan to get all three doses of the HPV vaccine in the next 12 months –Completely disagree–Completely agree</td>
<td>0.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude Toward Behavior</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>\textit{1. Item 4.} I think getting all three doses of the HPV vaccine in the next 12 months would be – Very bad–Very good</td>
<td>0.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>\textit{2. Item 5.} I think getting all three doses of the HPV vaccine in the next 12 months would be – Not at all protective–Extremely protective</td>
<td>0.84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>\textit{3. Item 6.} I think getting all three doses of the HPV vaccine in the next 12 months would be – Unnecessary–Necessary</td>
<td>0.68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>\textit{4. Item 7.} I think getting all three doses of the HPV vaccine in the next 12 months would be – Very Unhealthy–Very healthy</td>
<td>0.89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>\textit{5. Item 8.} I think getting all three doses of the HPV vaccine in the next 12 months would be – Disadvantageous–Advantageous</td>
<td>0.92</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6. **Item 9.** I think getting all three doses of the HPV vaccine in the next 12 months would be – Painful–Painless 0.50
7. **Item 10.** I think getting all three doses of the HPV vaccine in the next 12 months would be – Extremely harmful–Extremely beneficial 0.84

Subjective Norm 0.96 87.0%

1. **Item 11.** Most people who are important to me think that I should get all three doses of the HPV vaccine in the next 12 months – Completely disagree–Completely agree 0.93
2. **Item 12.** My parent(s) or legal guardian(s) would like me to get all three doses of the HPV vaccine in the next 12 months – Completely disagree–Completely agree 0.94
3. **Item 13.** Family members other than my parent(s) or legal guardian(s) (for example, sibling, aunt, uncle, grandparent, etc.) would like me to get all three doses of the HPV vaccine in the next 12 months – Completely disagree–Completely agree 0.96
4. **Item 14.** My friends would like me to get all three doses of the HPV vaccine in the next 12 months – Completely disagree–Completely agree 0.90

Perceived Behavioral Control 0.92 65.3%

1. **Item 15.** If I wanted to, I am sure I could get all three doses of the HPV vaccine in the next 12 months – Completely unsure–Completely sure 0.74
2. **Item 16.** For me to get all three doses of the HPV vaccine in the next 12 months would be – Extremely difficult–Extremely easy 0.86
3. **Item 17.** How much control do you have to get all three doses of the HPV vaccine in the next 12 months? No control–Complete control 0.83
4. **Item 18.** I am confident I can get all three doses of the HPV vaccine in the next 12 months, even if there is a financial cost – Very unconfident–Very confident 0.79
5. **Item 19.** I am confident I can get all three doses of the HPV vaccine in the next 12 months, even if my schedule is busy – Very unconfident–Very confident 0.82
6. **Item 20.** I am confident I can find a healthcare provider (for example, clinic, health center, physician’s office) where I can get all three doses of the HPV vaccine in the next 12 months – Very unconfident–Very confident 0.80

**Note.** Abbreviations: AVE, average variance extracted; GFI, goodness-of fit-index; KA, Kline’s alternative (2010); NFI, normed fit index; RMSEA, root mean square error of approximation.

Measurement model fit statistics: $\chi^2 = 271.414$, $df = 155$, $p = .000$; KA = 1.751; GFI = 0.907, NFI = 0.948, RMSEA = 0.054.
Figure 4.2. Theory of planned behavior-based HPV vaccination intentions measurement model illustrating indicator factor loadings, squared multiple correlations explaining the amount of variance each indicator provides on the latent construct, and beta-coefficients correlating latent factors among primary sample of undergraduate males (N = 256). HPV = Human papillomavirus.

**Structural model.** Structural equation modeling was employed to determine the predictive validity of the theoretical model. The adequately defined measurement model was tested for its ability to account for variance on the behavioral intention construct.

The initial structural model indicated reasonable fit ($\chi^2 = 271.41, df = 155, p = .000; KA = 1.751; GFI = 0.907; NFI = 0.948; RMSEA = 0.054$). Significant direct paths between attitude
toward behavior \((p = .009)\) and subjective norm \((p \leq .001)\) on behavioral intention were identified. Perceived behavioral control had non-significant direct effects on behavioral intention \((p = .517)\); subsequently, the perceived behavioral control latent construct was trimmed from the structural model.

The final structural model exhibited acceptable fit of the data \(\chi^2 = 129.78, df = 70, p = .000; KA = 1.854; GFI = 0.932; NFI = .948; \text{RMSEA} = 0.054\). Significant direct paths between attitude toward behavior \((p = .001)\) and subjective norm \((p = .000)\) on behavioral intention were identified. Combined, the latent constructs of attitude toward the behavior and subjective norm accounted for 58% of the variance in behavioral intention. The parameter estimates for the final structural model are provided in Table 4.7. The final HPV vaccination model with standardized regression weights is illustrated in Figure 4.3.

Table 4.7

Parameter Estimates for the Theory of Planned Behavior-based Structural Model Predicting Behavioral Intention to Get all Three Doses of the HPV Vaccine in the Next 12 Months \((N = 256)\)

<table>
<thead>
<tr>
<th>Constructs</th>
<th>(B)</th>
<th>(SE) (B)</th>
<th>(\beta)</th>
<th>(p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude toward behavior (\leftarrow) Behavioral intention</td>
<td>0.205</td>
<td>0.062</td>
<td>.169</td>
<td>.001</td>
</tr>
<tr>
<td>Subjective norm (\leftarrow) Behavioral intention</td>
<td>0.664</td>
<td>0.054</td>
<td>.667</td>
<td>.000</td>
</tr>
<tr>
<td>Perceived behavioral control (\leftarrow) Behavioral intention</td>
<td>0.040</td>
<td>0.062</td>
<td>.033</td>
<td>.517†</td>
</tr>
</tbody>
</table>

Note. Abbreviations: HPV, human papillomavirus; AVE, average variance extracted; GFI, goodness-of fit-index; KA, Kline’s alternative (2010); NFI, normed fit index; RMSEA, root mean square error of approximation. †\(p\)-value was based on the initial structural model. Structural model statistics \(\chi^2 = 129.78, df = 70, p = .000; KA = 1.854; GFI = 0.932, NFI = 0.968, \text{RMSEA} = 0.058; R^2\) value of behavioral intention for final specified model = 0.58.
Figure 4.3. Theory of planned behavior-based HPV vaccination intentions structural model elucidating standardized regression weights for primary sample of undergraduate males (N = 256). HPV = human papillomavirus.

**Summary**

The results of this investigation were delineated in Chapter 4. Descriptive statistics were used to describe the characteristics of the sample. Correlation coefficients assessed the internal consistency, construct reliability, and stability of the TPB constructs. Bivariate correlation coefficients described the relationships among the TPB constructs. Confirmatory factor analysis using the maximum likelihood (ML) established construct validity. Structural equation modeling tested the predictive validity of the model.

A valid and reliable instrument designed to measure constructs from the TPB was developed to predict HPV vaccination intentions of college males. Attitude toward the behavior and subjective norm were significant predictors of behavioral intention, whereas perceived behavioral control was not. Findings from this study provided an instrument that may be applied
in the design and evaluation of TPB-based interventions to promote HPV vaccination among undergraduate male populations.
CHAPTER 5

DISCUSSION

Human papillomavirus (HPV) is the most prevalent sexually transmitted infection in the United States, with the majority of cases occurring in young adult males between 20–24 years of age (Satterwhite et al., 2013). In spite of this, HPV vaccination rates among young adult males in the general population and in college populations remain low (ACHA, 2014; Williams et al., 2014). The overarching purpose of this study was to operationalize the direct constructs of the TPB to predict the HPV vaccination behavioral intentions of male undergraduate college students attending a large public southeastern university. This study represented the first attempt to conduct an elicitation study to identify salient opinions about HPV vaccination with college males. Further, this study was the first to operationalize HPV vaccination to mean intent to get all three doses of the HPV vaccine series in the next 12 months. Dosage information within the context of a specified time frame has the potential to influence college males’ behavioral intention to get vaccinated. This study provided a comprehensive measure of intentions aligned with current U.S. immunization guidelines and epidemiological research.

The instrumentation process resulted in a psychometrically valid and reliable tool to predict behavioral intentions to get all three doses of the HPV vaccine in the next 12 months. Moreover, the results of this investigation specified a theoretical framework that may be applied in the design and evaluation of HPV vaccination interventions developed to increase behavioral intentions among undergraduate male populations. In addition, this study reported college males’
awareness of HPV and HPV vaccine, as well as the sample’s engagement in sexual behaviors that place them at risk for HPV infection.

An evaluation of the current study’s hypotheses is provided in this final chapter. Based on the results of the hypotheses, conclusions were drawn and are presented in this chapter. In addition, the implications for health education and promotion, based on the conclusions, are also presented. Recommendations for future research and limitations of the current study are discussed. Finally, conclusions of this study are presented.

**Results of Research Questions**

**Research question 1.** What is the relationship between attitude toward the behavior and behavioral intention to get all three doses of the HPV vaccine in the next 12 months among college males? Null hypothesis 1 was developed to address this research question, which was stated as follows: *Attitude toward the behavior (ATT) will not have a significant relationship with behavioral intention (BI) to get all three doses of the HPV vaccine in the next 12 months among college males.* A Pearson product-moment correlation coefficient was calculated to assess the strength of association between attitude toward the behavior and behavioral intention. Attitude toward the behavior had a significant, positive moderate relationship with behavioral intention ($r (254) = .490, p < .001$). Consequently, null hypothesis 1 was rejected, and the attitude toward the behavior scale was retained for the measurement model.

**Research question 2.** What is the relationship between subjective norm and behavioral intention to get all three doses of the HPV vaccine in the next 12 months among college males? Null hypothesis 2 was developed to address this research question, which was stated as follows: *Subjective norm (SN) will not have a significant relationship with behavioral intention (BI) to get all three doses of the HPV vaccine in the next 12 months among college males.* A Pearson
product-moment correlation coefficient was calculated to assess the strength of association between subjective norm and behavioral intention. Subjective norm had a significant, positive strong relationship with behavioral intention ($r (254) = .725, p < .001$). Consequently, null hypothesis 2 was rejected, and the subjective norm scale was retained for the measurement model.

**Research question 3.** What is the relationship between perceived behavioral control and behavioral intention to get all three doses of the HPV vaccine in the next 12 months among college males? Null hypothesis 3 was developed to address this research question, which was stated as: Perceived behavioral control (PBC) will not have a significant relationship with behavioral intention (BI) to get all three doses of the HPV vaccine in the next 12 months among college males. A Pearson product-moment correlation coefficient was calculated to assess the strength of association between perceived behavioral control and behavioral intention. Perceived behavioral control had a significant, positive weak relationship with behavioral intention ($r (254) = .215, p < .001$). Consequently, null hypothesis 3 was rejected, and the perceived behavioral control scale was retained for the measurement model.

**Research question 4.** To what extent do the constructs of attitude toward the behavior, subjective norm, and perceived behavioral control predict behavioral intention to get all three doses of HPV vaccine in the next 12 months among college males? Null hypothesis 4 was developed to address this research question, which was stated as: The constructs of attitude toward the behavior ($\beta_1$), subjective norm ($\beta_2$), and perceived behavioral control ($\beta_3$) combined together will not significantly predict behavioral intention to get all three doses of the HPV vaccine in the next 12 months ($Y$) among college males. As a pre-requisite step to testing the predictive validity of the model, confirmatory factor analysis (CFA) applying the Maximum
Likelihood (ML) method was conducted to assess construct validity of the measurement model. The initial measurement model indicated adequate fit. Co-varying errors within the attitude toward behavior, subjective norm, and perceived behavioral control constructs improved overall fit. Next, structural equation modeling was employed to determine the predictive validity of the theoretical model. The adequately defined measurement model was tested for its ability to account for variance on the behavioral intention construct.

The initial structural model indicated adequate fit. Significant direct paths between attitude toward behavior ($p = .009$) and subjective norm ($p < .001$) on behavioral intention were identified. Perceived behavioral control had non-significant direct effects on behavioral intention ($p = .517$); subsequently, the perceived behavioral control latent construct was trimmed from the structural model. The final structural model exhibited acceptable fit of the data. Significant direct paths between attitude toward behavior ($p = .001$) and subjective norm ($p = .000$) on behavioral intention were identified. Combined, the latent constructs of attitude toward the behavior and subjective norm accounted for 58% of the variance in behavioral intention. Therefore, null hypothesis 4 was rejected.

**Implications for Health Education and Promotion**

Based on the findings of this study, interventions targeting college males should focus on increasing positive attitude toward the behavior and subjective norm to increase behavioral intentions to get all three doses of the HPV vaccine in the next 12 months. The instrument developed and validated in this study may be used to design and evaluate a theory of planned behavior-based intervention to increase behavioral intentions to get all three doses of the HPV vaccine in the next 12 months for this sample.
The mean attitude toward the behavior was 30.78 (SD = 9.50), based on a possible range of 7–49, which indicates the need to boost college males’ positive attitudes toward getting all three doses of the HPV vaccine in the next 12 months. Furthermore, attitude toward the behavior (p = .001) was a statistically significant predictor of behavioral intention to get all three doses of the HPV vaccine in the next 12 months. Therefore, future interventions designed to increase college males’ behavioral intentions to get all three doses of the HPV vaccine in the next 12 months should consider targeting attitude toward the behavior. This may be accomplished by targeting salient behavioral beliefs, which are proposed to constitute one’s attitude toward the behavior (Ajzen, 2006b; Ratanasiripong, 2015).

To reify the attitude toward the behavior construct within an intervention might entail providing college males with information about the benefits of getting all three doses of the HPV vaccine within the next 12 months, as well as potential consequences (e.g., genital warts, anogenital cancer; transmit virus to another partner) if the individual does not get vaccinated (Abraham & Michie, 2008). Further, interventions can reify the attitude toward the behavior construct by emphasizing that getting all three doses of the HPV vaccine within a 12-month time frame is healthy. This may be accomplished by highlighting that the vaccine offers protection against the most common sexually transmitted infection in the world, and subsequently against anogenital warts and HPV-associated cancers. Additionally, interventionists can reinforce that the recommendation for catch-up HPV vaccination includes college-age males (specifically males between 18 and 26). Interventions should emphasize that the vaccine is extremely safe by providing basic 4vHPV safety information from pre-and post-licensure studies (Arnheim-Dahlstrom et al., 2013; Chao et al., 2012; Grimaldi-Bensouda et al., 2014; Klein et al., 2012; Macartney, et al., 2013). Specifically, practitioners can provide basic statistics regarding the
relatively low number of adverse events associated with the 4vHPV vaccine; in particular, interventionists can underscore that approximately 92% of the adverse events that have been documented were non-serious (CDC, 2013c). Furthermore, parallels can also be drawn between the safety profiles of the 4vHPV vaccine compared to other recommended vaccines for young adult males, including influenza, and tetanus, diphtheria, and pertussis (Tdap); doing so may help to promote the belief that the HPV vaccine is safe (Priest, Knowlden, & Sharma, 2015). Moreover, practitioners can reify the attitude toward the behavior construct by emphasizing that the 4vHPV vaccine is highly effective in preventing HPV. Interventionists may provide information about how effective the vaccine has been in clinical trials and post-licensure studies. Further, interventions should reinforce that the 4vHPV vaccine prevents four HPV strains that account for the majority of HPV-associated cancers and genital warts cases. Specifically, practitioners may stress the importance of getting all three doses of the HPV vaccine within a 6-month to 12-month period in order for the vaccination to be most effective in protecting against HPV (Giuliano et al., 2011b; LaMontagne et al., 2013; Lin et al., 2014; Muñoz et al., 2010; Zimmerman et al., 2010).

Practitioners may consider emphasizing that getting all three doses of the HPV vaccine in the next 12 months is necessary. Practitioners can explain that the virus is spread through sexual contact, including oral, vaginal, or anal sex, which is relevant because most college males have engaged in sex. Second, practitioners can explain that male condoms do not provide complete protection against HPV because the virus is spread through the skin. Third, practitioners can highlight that young adult males comprise the highest risk group for HPV infection, and that a persistent HPV infection can manifest as anogenital warts or cancers. Additionally, practitioners can emphasize that the virus is typically asymptomatic and there is currently no FDA-approved
test to detect HPV in males; therefore, without vaccination, they could spread the virus to current or future sexual partners. Although the vaccine is most effective when the 3-dose series is completed within a 12-month timeframe and prior to first sexual contact, the vaccine can protect against strains that sexually active individuals have not acquired. For college males who are not sexually active, practitioners can reinforce that vaccination is recommended prior to sexual contact; thus, it would an ideal time for these males to get all three doses of the HPV vaccine in the next 12 months. In light of the fact that college males often believe HPV is a woman’s disease, practitioners should reinforce that males need to get all three doses of the HPV vaccine in the next 12 months (Allen et al., 2009). Specifically, practitioners can discuss that prevalence and incidence rates of HPV are higher in males than females (Hariri et al., 2011; Partridge et al., 2007; Giuliano et al., 2011a). Further, practitioners can explain that oropharyngeal cancer is the most common HPV-associated cancer among U.S. males, and approximately 80% of all oropharyngeal cancers occur in males (CDC, 2014b). Moreover, practitioners can emphasize that HPV is projected to cause more oropharyngeal cancers than cervical cancers in the United States by 2020 (Chaturvedi et al., 2011). Finally, interventionists could provide participants with an opportunity to reflect on and evaluate their personal beliefs about getting all three doses of the HPV vaccine in the next 12 months. This could potentially be achieved through small group discussion, journaling with feedback, anticipated regret, motivational interviewing, behavioral contract, or other techniques.

The mean subjective norm score was 11.61, with a possible range from 4–28, which indicates that college males’ perceived social pressure to get all three doses of the HPV vaccine in the next 12 months is low. Subjective norm was the strongest predictor ($\beta = 0.667, p = .000$) of behavioral intention to get all three doses of the HPV vaccine in the next 12 months. The
findings of this study suggest that future interventions designed to increase college males’
behavioral intentions to get all three doses of the HPV vaccine in the next 12 months should
target subjective norm.

The subjective norm construct may be reified within an intervention by targeting
normative beliefs, which emphasize that referent others/groups would approve of them getting
all three doses of the HPV vaccine in the next 12 months (Abraham & Michie, 2008). For
instance, an intervention might reinforce that parents/guardians, other family members (e.g.,
sibling, aunt, uncle, grandparent), friends, and healthcare providers would approve of college
males getting all three doses of the HPV vaccine in the next 12 months. Specifically, if a health
care provider such as a medical doctor, nurse practitioner, or physician assistant from the college
males’ student health center at their respective university were to facilitate the intervention, this
could help to reinforce the belief that college males’ healthcare providers would approve of them
getting all three doses of the HPV vaccine in the next 12 months. This could be accomplished by
having a healthcare provider serve as the primary facilitator for a face-to-face or online
educational session. Several studies have reported that a physician’s recommendation for HPV
vaccination is the strongest predictor of HPV vaccination among adolescents and young adults
(Dorell et al., 2011; Gargano et al., 2013; Lau, Lin, & Flores, 2012; Ratanasiripong et al., 2013;
Reiter et al., 2013; Rosenthal et al., 2011; Ylitalo, Lee, & Mehta, 2013). Thus, in an ideal
intervention, the university-based physician could have a private conversation about HPV
vaccination with college males during an appointment at the student health center. If an
intervention was delivered via the Web, it could be tailored based on whether the individual was
in a sexual relationship. If the participant indicated that they were in sexual relationship(s), the
intervention could emphasize that the sexual partner would approve of them getting all three
doses of the HPV vaccine in the next 12 months. Even if one partner is already infected with HPV, it is possible for HPV not to be transmitted to the other partner. For instance, the partners may have only engaged in oral sex using a condom, which carries a much lower risk than unprotected anal or vaginal sex. Therefore, vaccination could help to provide protection against strains they have not acquired from their partner. If they were not currently in a sexual relationship, the intervention contents could reinforce that a future sexual partner would approve of them getting vaccinated because it would provide their partner with some cross-protection against HPV. Specifically, interventions could provide interpersonal communication training, with opportunities for college males to practice initiating and facilitating conversations about getting all three doses of the HPV vaccine within the next 12 months with current or future sexual partners.

Further, interventions could be extended to parents/guardians of college males to educate them about the safety, efficacy, and value of getting all three doses of the HPV vaccine in the next 12 months (Krawczyk et al., 2012b). This strategy could facilitate conversations about the HPV vaccine among parents/guardians and their college-age sons. This approach may indirectly increase college males’ normative beliefs that their parents/guardians believe they should get all three doses of the HPV vaccine in the next 12 months. To further increase college males’ subjective norm, the indirect approach could also be extended to college males’ friends and family members other than parents/guardians. In particular, practitioners can encourage college males to examine the responses that referent others, including parents/guardians, friends, family members, or current/future sexual partners, may provide against them getting the HPV vaccine, followed by opportunities to practice responding in an effective manner (Brawner et al., 2013).
The mean perceived behavioral control score, though not a significant predictor was 29.69 with a possible range from 6–42, which fell slightly above the mid-point range. This finding indicates that there is a need to further increase college males’ confidence in their ability and sense of control to get all three doses of the HPV vaccine in the next 12 months. There are several potential reasons why perceived behavioral control was not a significant predictor of behavioral intention within the structural model. First, measurement error may have occurred. While the instrumentation process was rigorous, it did not include cognitive pre-testing with members of the priority population. Additionally, respondents may not have had adequate awareness or knowledge about HPV vaccination to discern what it would actually entail to get all three doses of the HPV vaccine in the next 12 months. Consequently, this may have resulted in some inflation in the overall construct score and minimal variability in responses for the sample, which in turn lead to perceived behavioral control being non-significant within the structural model. Additionally, the majority of respondents had health insurance (96.5%) and could receive the vaccine at no cost, which may in part explain the sample’s moderate level of sense of control over their ability to get all three doses of the HPV vaccine in the next 12 months (Patient Protection and Affordable Care Act, 2010). It cannot be determined whether respondents knew how much getting all three doses of the HPV vaccine would cost, and whether this influenced their responses; however, it is unlikely that most respondents would know the cost given that there was such low awareness about the HPV vaccine. The findings from this investigation are consistent with previous studies that tested the TPB in predicting HPV vaccination intentions of college students (Bennett et al., 2012; Fisher et al., 2013; Ratanasiripong et al., 2013; Ratanasiripong, 2015). Specifically, these studies found that attitude toward the behavior and subjective norms were significant predictors in the model but perceived behavioral control was
not; the researchers did not address why this may have occurred. Furthermore, these studies explained 44%–65% of the variance in behavioral intention, with an average of 57% of the variance explained by attitude toward the behavior and subjective norm constructs (Bennett et al., 2012; Fisher et al., 2013; Ratanasiripong et al., 2013; Ratanasiripong, 2015). Studies that have examined the TPB in predicting HPV vaccination intentions of college women found that all proximal TPB constructs were significant predictors in the model and explained 39% and 54.4% of the variance in intentions, respectively (Gerend & Shepherd, 2012; Juraskova et al., 2012). Likewise, another study investigated the TPB’s ability to explain pre-service teachers’ behavioral intentions to use technology; attitude toward usage and subjective norms were significant predictors, but perceived behavioral control was not (Teo & Lee, 2010). The investigators stated that pre-service teachers may not have intended to use technology “simply because the conditions were favorable (e.g., technical support was provided)” (p. 66). However, similar to the results in the current study, perceived behavioral control was significantly correlated with attitude and subjective norm. Other studies that examined the TPB’s ability to predict household recycling found similar results; attitude and subjective norm were significant predictors of behavioral intention, but perceived behavioral control was not (Boldero, 1995; White & Hyde, 2012).

Although perceived behavioral control was not a significant predictor in the present study, there is room for improvement based on the construct’s mean value, which fell slightly above the mid-point range. It is possible that the predictive validity of perceived behavioral control was masked due to exclusion of potential mediators in the final model. The perceived behavioral control construct may be reified within an intervention targeting college males by emphasizing that most public and private health insurances cover the cost of all three doses of
the HPV vaccine. In turn, this can help to increase college males’ sense of control over their ability to get all three doses of the HPV vaccine in the next 12 months. For college males who are 19 years of age or older who lack health insurance, practitioners can provide information about the Merck Vaccine Patient Assistance Program (MVPAP) (Merck & Co., Inc., 2014). MVPAP is a private and confidential program that is funded by Merck for adults 19 years of age and older who cannot afford vaccines. Specifically, the program offers HPV vaccines free of charge to adults who live in the United States; are between 19 and 26 years of age; have no health insurance coverage; and have an annual household income less than $47,080 for individuals, less than $63,720 for couples, or less than $97,000 for a family of four. Furthermore, practitioners can provide college males with a list of local sites (e.g., university health center, clinics, health department) where the 4vHPV vaccine is available. To further boost perceived behavioral control, practitioners can assist college males in identifying dates and times that they are available to receive each dose of the HPV vaccine within the next 12 months. Since logistical barriers such as hassle and time are often significant obstacles to males’ HPV vaccine uptake, practitioners can stress that college males have the ability to schedule an appointment that is convenient for their personal schedule (Daley et al., 2010a; Gerend & Barley, 2009; Hernandez et al., 2010; Reiter et al., 2010a; Reiter, Brewer, & Smith, 2010b). Scheduling an appointment in advance rather than using walk-in services may reduce the total amount of time that they spend at the healthcare setting. Practitioners can explain that the HPV vaccine can be received during a routine check-up or combined with other recommended vaccines.

Overall, the sample had low ($M = 8.52, SD = 5.30$) behavioral intention to get all three doses of the HPV vaccine in the next 12 months, based on a possible range of 3–21. This finding is not particularly surprising because the sample had limited awareness of the HPV vaccine prior
to participating in the study. Results of this study suggest practitioners should target increasing college males’ behavioral intention to get all three doses of the HPV vaccine in the next 12 months. The results of this study are consistent with other studies, which reported college males’ behavioral intentions to get the vaccine were low (Fisher et al., 2013; Priest et al., 2015). In contrast, one cross-sectional study conducted with college males at a Canadian university in 2008–2009 reported that nearly half (41%) of the sample intended to receive the HPV vaccine. However, this study was conducted after the Canadian approval of HPV vaccination for females but prior to approval for males. The timing of the study may have impacted the results because respondents were asked to indicate their intention to engage in a behavior that was hypothetical (Krawczyk et al., 2013). Although it was not surprising that college males had low behavioral intention to get all three doses of the HPV vaccine in the next 12 months within the present study, this finding is concerning due to increasing HPV-associated cancer rates among young men in recent years (Chaturvedi, 2010; Chaturvedi et al., 2011; Kurdgelashvili et al., 2013).

For participants who report some amount of behavioral intention, interventionists may promote HPV vaccine series completion by asking participants to indicate when, where, and how they plan to get each dose of the HPV vaccine within the next 12 months (Ajzen, 2006b). This technique is referred to as an implementation intention, and has demonstrated effectiveness with increasing individuals’ ability to initiate and maintain health behaviors such as cervical cancer screening and breast cancer screening (Moss, 2009; Orbell, Hodgkins, & Sheeran, 1997; Sheeran & Orbell, 2000). Implementation intention is one of the most effective strategies available to facilitate the transition from intention to behavior (Gollwitzer, 1999). This technique may support participants who have some level of behavioral intention to follow through to get all three doses of the HPV vaccine within the next 12 months. Additionally, interventions can
employ text or electronic messaging to remind college males of their HPV vaccination appointment dates (Alexander, Stupiansky, Ott, Herbenick, Reece, & Zimet, 2014; Kharbanda et al., 2011).

Overall, awareness of human papillomavirus (HPV) among the sample was low; nearly one third (32.2%) of the sample reported that they had never heard of HPV before participating in the study. Additionally, awareness of the HPV vaccine was low; almost half (45.3%) of the sample indicated that they had never heard of the HPV vaccine before participating in the study. Results of this study suggest practitioners should actively focus on increasing college males’ awareness of HPV and HPV vaccine. These findings are consistent with previous studies that examined HPV and HPV vaccine awareness among college males (Beshers, Murphy, Fix, & Mahoney, 2015; Fontenot et al., 2014; Little, Ogilvie, Mirwaldt, 2015; Priest et al., 2015; Ratanasiripong, 2015). A 2010 cross-sectional study conducted with undergraduate male students at two northeastern US universities reported that 76.3% of males had heard of HPV, but only 45.6% had heard of a vaccine to protect against HPV (Beshers et al., 2015). A 2012 cross-sectional study conducted with male college students in Greater Vancouver, Canada reported that 80.1% of the sample had heard of HPV, but 66.4% were unaware that an HPV vaccine was available for men (Little et al., 2015). Interestingly, the sample was largely aware that an HPV vaccine was available to women (86.4%, n = 121). In a 2012 qualitative study conducted with college males at a large northeastern university, Fontenot and colleagues (2014) reported that more than one third of the responses (36.9%, n = 124) were coded into the lack of awareness and knowledge [about HPV and HPV vaccination] category. Common responses were, “I have not received the vaccine and I don’t think I will be getting it because I’ve never heard of it” and “Never thought about it or knew of people getting it” as well as, “Don’t know about it. I will if
my doctor says I should” (p. 189). A cross-sectional study conducted with college men at a large public southeastern university revealed that more than three-quarters (78.0%; n = 241) of the sample had heard of HPV before participating in the study, but only 58.7% (n = 183) had heard of the HPV vaccine before participating in the study (Priest et al., 2015). A cross-sectional study conducted with a convenience sample of college males at a large public university in southern California reported that 51.2% of the sample was aware of the HPV vaccine (Ratanasiripong, 2015).

Interventions can promote college males’ awareness of HPV by providing basic information about the disease, such as its prevalence, routes of transmission, groups that are at high risk for HPV infection, and negative outcomes associated with persistent HPV infection. Practitioners can increase college males’ awareness of the HPV vaccine by disseminating essential information about the vaccine, including diseases it provides protection against, intended audience, cost, and total number of doses as well as schedule for completion (Alexander et al., 2014). This information can be displayed on walls or in bathroom stalls of campus dormitories, academic buildings around campus, student health centers, student recreation centers, fraternity houses, or other high traffic areas on campus. Additionally, university student health centers and health education/promotion programs can provide information about HPV and HPV vaccine in highly visible locations on their websites or other social media (The University of Arizona, n.d; Brown University, n.d.).

The majority (86.3%; n = 221) of the sample reported that they had ever engaged in oral, vaginal, or anal sex. Given that skin-to-skin contact during oral, vaginal, or anal sex is the primary risk factor for HPV infection, most college males in the sample are already at risk for HPV infection (Partridge et al., 2007; CDC, 2014a). Additionally, the current sample reported
having engaged in sexual behaviors with multiple sexual partners over the course of their lifetime and in the last 12 months. Having multiple lifetime sexual partners and multiple recent sexual partners are well-documented risk factors for HPV infection (Baseman & Koutsky, 2005). In particular, the sample reported having between 6–7 lifetime oral sex partners, between 5–6 lifetime vaginal sex partners, and approximately 0–1 lifetime anal sex partners. Furthermore, respondents indicated having approximately 2 oral sex partners in the last 12 months and 1–2 vaginal sex partners in the last 12 months ($M = 1.87$). The sample reported an average of 0–1 anal sex partners in the last 12 months. More than half of the sample reported having engaged in oral sex in the past 30 days (54.7%) and vaginal sex in the past 30 days (55.5%). These percentages are slightly higher than those reported in the executive summary of the National College Health Assessment II from Spring 2014. Specifically, the NCHA II report indicated that 45.9% of college males had engaged in oral sex in the past 30 days, and 45.8% of college males had engaged in vaginal sex in the past 30 days (ACHA, 2014). One possible explanation for this difference is that the sample for the present study under-sampled first-year undergraduate males, who may not have had as many opportunities to engage in sex, compared to upperclassmen.

Based on the results of this study, unvaccinated college males in this sample have engaged in sexual behaviors that place them at risk for acquiring HPV. Thus, there is a need for interventions to promote HPV vaccine initiation and series completion within a 12-month timeframe among this population. Furthermore, interventions should consider including information that reinforces that having multiple sexual partners substantially increases an individual’s risk for acquiring HPV. Interventions should also highlight that HPV can be transmitted through skin-to-skin contact during oral, vaginal, or anal sex, and that condoms do not provide full protection from the virus (Winer et al., 2006). The sample’s low awareness of
HPV and HPV vaccine coupled with their engagement in sexual behaviors that place them at risk for HPV infection further reinforces the need for HPV vaccination education interventions designed specifically for this population. Epidemiologic investigations have also found strong associations between age at sexual debut, sexual frequency, condom use, and HPV infection but these risk factors were not assessed in the present study (Baseman & Koutsky, 2005; Dunne et al., 2006; Lu et al., 2009; Nielson et al., 2007).

Ideally, interventions should target first-semester, first-year undergraduate males, as the probability that a college male will have sexual contact increases over the span of their collegiate career (Siegel, Klein & Roghmann, 1999). Targeting first-semester, first-year undergraduate males for HPV vaccination interventions may help to increase vaccination rates among college males early on in the college experience, and subsequently, reduce the prevalence of HPV within college populations. However, since many upperclassmen remain unvaccinated and are at risk for HPV infection, there is a need to include all undergraduate males in HPV vaccination interventions, regardless of their year in school.

**Future Research**

The findings from this study indicate the need for future social science research specific to HPV vaccination. Replication of the present study with a regional or national sample of institutions of higher education (IHE) could strengthen generalizability. Differences by region could be investigated as well as differences among diverse types of institutions of higher education (e.g., community colleges, historically black college and universities, private institutions, liberal arts colleges). Consideration should be given to replication of this study using a prospective study design that assesses whether respondents have received all three doses of the HPV vaccine at 12-month follow-up. It is critical to collect longitudinal data because behavioral
intention does not always translate to action; therefore, if a future HPV vaccination intervention targeting college males is to be based upon the TPB, is it crucial to investigate the strength of the behavioral intention and behavior relationship (Jaccard & Blanton, 2007). Additionally, future research may examine possible mediators and moderators of the TPB constructs to fully operationalize the theoretical framework.

Provided the sample’s low awareness of HPV and HPV vaccine, qualitative research that investigates college males’ HPV and HPV vaccine knowledge is warranted. Identification of college males’ knowledge and misconceptions about HPV and HPV vaccine could assist in designing a more relevant intervention for this population. Furthermore, research is necessary to identify appropriate HPV vaccine messages, messengers (e.g., health educator, parent/guardian, peer, healthcare provider, etc.), settings (e.g., traditional classroom, computer lab, website, social media, healthcare facility) and modalities (e.g., lecture, video, group discussion, worksheet, demonstration, etc.) for design of HPV vaccination interventions targeting college males. Based on these findings, a HPV vaccination intervention employing a randomized control trial design could be implemented and evaluated with college males. The intervention could consist of two arms; one arm could target increasing HPV and HPV vaccine awareness and knowledge, and the other arm could target the TRA constructs as well as HPV and HPV vaccine awareness and knowledge. The instrument developed for the present study could be used to evaluate the intervention at baseline, post-test, and 12-month follow-up. HPV vaccine series completion could also be assessed at 12-month follow-up.

Future studies targeting adolescents or young adults may consider assessing respondents’ age at first sexual contact, including age at first oral, vaginal, and/or anal sex, as early sexual initiation is a risk factor for HPV infection; the findings could be incorporated as part of an
intervention for a population who is at high-risk for HPV. For respondents who indicate that they have ever engaged in oral, vaginal, or anal sex, researchers could assess condom or other barrier use at last sex (oral, vaginal, anal) as well as how frequently the respondent or their sexual partner(s) used male condoms or other barrier method during sex. These data could further illustrate the sample’s degree of risk, and be used to reinforce that HPV vaccination is necessary within an intervention.

Future HPV vaccination research targeting college students may consider assessing Greek-affiliation status. Previous studies have found that students who are affiliated with Greek organizations are more likely to use alcohol and to experience alcohol-related negative consequences (Capone, Wood, Borsari, & Laird, 2007; Wechsler, Dowdall, Davenport & Castillo, 1995). Alcohol use can impair sexual decision-making; therefore, Greek-affiliated organizations may be an important population to target for HPV vaccination programs (ACHA, 2014b; Wechsler, Davenport, Dowdall, Moeykens, & Castillo, 1994).

Currently, no regional or baseline data exists to determine if college males receive any form of HPV and HPV vaccine education from their IHE. In Spring 2014, 28% of undergraduate males nationally reported receiving sexually transmitted disease/infection prevention information from their college or university; however, it is unknown what percentage of the sample received information about HPV and HPV vaccination (ACHA, 2014b). More than one third (39%) of undergraduate males nationwide indicated that they were interested in receiving information about sexually transmitted disease/infection prevention; thus, it can be corroborated that many college males would like to receive information about HPV and HPV vaccination. A systematic review investigating primary prevention HPV interventions targeting college students identified only 12 interventions conducted between January 2000 and January 2014; of those, only four
included college males, and only one exclusively targeted college males (Priest & Knowlden, 2015). Therefore, a regional or national baseline assessment is needed to ascertain the proportion of institutions of higher education that provide HPV and HPV vaccine education to college students. Additionally, the assessment is needed to identify the type, setting, frequency, and duration of educational activities that have been employed, as well as any data about the reach or effectiveness of those programs. For instance, college males could potentially receive information via their academic coursework, student health center, campus housing, another campus venue, mail, or online.

In the United States, the average age of sexual debut is approximately 17 years, and kissing, petting, and oral sex may occur before sexual intercourse; subsequently, many HPV infections occur prior to college (Centers for Disease Control and Prevention [CDC], 2013e). Moreover, the ideal period for HPV vaccination is prior to sexual contact; therefore, research should be extended to middle and high-school age males. Public schools are a logical venue for HPV vaccination interventions as they have the potential to reach numerous youth, and can simultaneously target vaccine-eligible females and males (Brotherton et al. 2011; Gertig et al., 2011; Tan et al., 2011). In addition to being a natural setting for an educational intervention, many public schools have the capability to offer the HPV vaccine on site. While a few school-based interventions have demonstrated success, it is unknown if HPV prevention programs are being implemented on a broader scale (Kessels et al., 2012; Moss et al., 2014; Paul & Fabio, 2014). A baseline assessment is needed to determine if HPV prevention programs are being implemented in K-12 schools on a state, regional, or national level, and whether such programs are effective at increasing HPV vaccine series completion among vaccine-eligible youth.
It is not clear why subjective norm and behavioral intentions were low among this population. This result could be because there have not been any HPV vaccination interventions conducted among this group, which is likely given low HPV vaccine awareness among the sample. Another possible explanation is that interventions have targeted this group but have been poorly designed or implemented. Regardless of the reason, this finding warrants qualitative research to further investigate why college males do not perceive great social pressure to get all three doses of the HPV vaccine, and why they do not intend to get all three doses of the HPV vaccine in the next 12 months. It would also be interesting to explore why college males have a moderate sense of control to get all three doses of the HPV vaccine within the next 12 months.

Policy-level interventions have the potential to influence health behavior on a large scale; therefore, future research could examine college students’ perspectives on an HPV vaccine mandate for vaccine-eligible individuals enrolled at IHE’s. A recent study conducted with college students at two large Texas universities reported that 48.9% of college students support an HPV vaccine mandate for individuals ages 18 to 26 (Smith, Wilson, Pulczinski, & Ory, 2014). The study could be replicated with a regional or national sample of college students to improve generalizability. Additionally, a future study could investigate the extent to which college students would support an opt-out option for HPV vaccine mandates at IHE’s on the basis of medical, religious, or moral reasons.

Limitations

Several limitations should be considered when interpreting the results of this study. Participants were recruited from a convenience sample of male undergraduates at a single large public southeastern university. Therefore, the results may not be generalized beyond the study participants. Further, the sample included an oversampling of non-Hispanic, Caucasian, and
heterosexual participants. However, given the demographic make-up of the institution, this is not surprising. First year undergraduate males were underrepresented in the study, so the results may not be generalizable to first year undergraduate males. This study employed a cross-sectional design, which inhibits the ability to establish causality among variables. The results of this study were based on self-report, which assumed that participants responded accurately and honestly. For instance, participants may have been hesitant to share information about their HPV vaccination intentions, because the vaccine is for a disease that is primarily transmitted through sexual contact. In an attempt to overcome potential social desirability bias, the instrument was delivered electronically and participants were informed that their responses were confidential. Another limitation is that participants might have misinterpreted items on the instrument, which could have skewed participant responses. However, given the intensive pre-testing that was employed, it is unlikely this occurred. Additionally, three of the TPB variables were non-normally distributed, which may have influenced the results; thus, the findings based on these results should be interpreted cautiously.

The TPB has some inherent limitations. Primarily, it is an intrapersonal level theory. Although the TPB acknowledges normative influences, it does not directly consider interpersonal, economic, environmental, or political factors that may influence an individual’s intention to engage in a behavior (Boston University School of Public Health, 2013). Further, the TPB assumes that an individual has received necessary resources and opportunities to successfully engage in a given behavior, regardless of their behavioral intention. The model assumes that behavioral decision-making is rooted in a rational thought process. However, many behaviors are performed irrationally. Further, the TPB does not consider affective factors such as mood, fear, or threat. For instance, fear of a persistent HPV infection may influence behavioral
intention to get all three doses of the HPV vaccine in the next 12 months. Additionally, the TPB assumes that behavior results from a linear decision-making process; subsequently, it does not acknowledge that behavior can change over time. Thus, if an individual receives one dose of the vaccine within the next 12 months, this will not necessarily translate to getting all three doses because behavior can change over time. Although perceived behavioral control assesses the amount of control that a person believes they have to perform the given behavior, the model does not measure actual control over the behavior. Overall, the sample self-reported having moderate to high perceived behavioral control to get all three doses of the HPV vaccine in the next 12 months; however, in reality, the respondents’ actual control to do so may be low. Finally, this investigation only measured the proximal constructs of the TPB. Therefore, the strength and saliency of the samples’ behavioral, normative, and control beliefs as well as the relationship of those beliefs to attitude toward the behavior, subjective norm, and perceived behavior were not assessed. As the goal of this study was to test a TPB-based prediction model, assessing the proximal constructs was deemed adequate (Ajzen, 2014a; Ajzen & Fishbein, 1980).

Another limitation of this study is the examination of behavioral intention as the outcome variable rather than HPV vaccine series completion within a 12-month timeframe. Consequently, the whole TRA and TPB theories were not tested within the context of the behavior. Assessment of the full theories would have entailed the PI following up with respondents one year after completing the instrument to determine if they had received all three doses of the HPV vaccine within the last 12 months. While the scientific literature indicates behavioral intention does not necessarily lead to behavioral action, a few studies conducted with college students have found that behavioral intention to get the HPV vaccine predicted HPV vaccine uptake (Jaccard & Blanton, 2007; Gerend & Shepherd, 2012; Juraskova et al., 2012; Patel et al., 2012).
Longitudinal research that examines the temporal relationship between the TPB’s theoretical constructs is needed; in particular, prospective research is warranted to better understand the temporality of behavioral intention as it relates to getting all three doses of the HPV vaccine within a 12-month time frame.

Conclusions

This study contributed to the literature by providing a comprehensive measure of behavioral intention to get the HPV vaccine that is aligned with U.S. immunization guidelines and epidemiological research. Moreover, this research offers new information regarding intrapersonal factors that influence college males’ behavioral intention to complete the HPV vaccine series. The findings of this study reinforce the need to more actively target HPV and HPV vaccine awareness among college males.

Attitude toward behavior and subjective norm were significant predictors of behavioral intention to get all three doses of the HPV vaccine in the next 12 months, whereas perceived behavioral control was not. Both of these significant predictors are modifiable, and should be considered as targets within interventions designed to increase HPV vaccination intentions among vaccine-eligible undergraduate college males. Moreover, the instrument developed and for this study may be used to design and evaluate TPB-based interventions to promote HPV vaccination among undergraduate college males. Currently, the majority of males enters college unvaccinated and partakes in sexual behaviors that place them, along with their current or future sexual partners, at risk for HPV infection. Therefore, public health education programs that promote catch-up vaccination for college males are needed. Institutions of higher education are uniquely positioned to provide HPV vaccination interventions for this high-risk population as a
strategy to improve HPV vaccination rates, and subsequently, to reduce HPV-associated morbidities.

**Summary**

In this chapter, the conclusions, implications for health education and promotion, recommendations for future research, and limitations of the study were discussed. Conclusions were drawn based on the results of the tested hypotheses, leading to specification of a TPB-based model for predicting the behavioral intention of undergraduate males. The findings of this study reinforce the need to more actively target HPV and HPV vaccine awareness among college males. Suggestions for designing an intervention based on the findings of this study were presented. Recommendations for future social science research related to HPV vaccination were delineated and limitations of this study were discussed. Lastly, conclusions of this study were presented.
REFERENCES


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Appendix A

Qualitative Salient Elicitation Questionnaire (Reformatted to Fit Two Sheets Per Page)
THE UNIVERSITY OF ALABAMA
HUMAN PAPILLOMAVIRUS VACCINATION BELIEFS QUESTIONNAIRE

I am conducting a study on human papillomavirus (HPV) vaccination intentions in college students. I am interested in the reasons why college students do or do not intend to get the HPV vaccine. I would appreciate your responses to some questions about this study.

Please answer the following questions to ensure you are eligible to participate in this study. Place an "X" on the appropriate circle.

Are you under 18 years of age?
☑️ Yes
☑️ No

Are you over 26 years of age?
☑️ Yes
☑️ No

Have you received any doses of the human papilloma virus (HPV) vaccine, popularly known as Gardasil or Cervarix?
☑️ Yes
☑️ No

Instructions: Please take a few minutes to tell me what you think about getting the HPV vaccine. There are no right or wrong responses; I am merely interested in your personal opinions.

• In response to questions 1-9, please list the thoughts that come immediately to mind. Write each thought on a separate line.

  • Human papillomavirus (HPV) is a sexually transmitted infection.
  • For the best protection against HPV, three HPV vaccine shots (doses) are needed.
  • All three shots should be received within a 12-month period of time.

Section 1: (please print your answers)

1. What do you believe are the advantages of getting all three doses of the HPV vaccine in the next 12 months?

2. What do you believe are the disadvantages of getting all three doses of the HPV vaccine in the next 12 months?

3. Is there anything else you associate with your own views about getting all three doses of the HPV vaccine in the next 12 months?

Section 2: (please print your answers)

4. Are there any individuals or groups who would approve (directly or indirectly) of your getting all three doses of the HPV vaccine in the next 12 months?

If you answered "YES" to ANY of these questions, please STOP and DO NOT take this questionnaire.

If you answered "NO" to EACH of these questions, please proceed.
5. Are there any individuals or groups who would disapprove (directly or indirectly) of your getting all three doses of the HPV vaccine in the next 12 months?___

6. Is there anything else you associate with other people’s views about you getting all three doses of the HPV vaccine in the next 12 months?___

Section 3: (please print your answers)

7. What factors or circumstances would make it easy or enable you to get all three doses of the HPV vaccine in the next 12 months?___

8. What factors or circumstances would make it difficult or impossible for you to get all three doses of the HPV vaccine in the next 12 months?___

Section 4: (please print your answers)

9. Are there any other thoughts or opinions that you would like to share about getting all three doses of the HPV vaccine in the next 12 months?___

Section 5: (please place an “X” on the appropriate circle)

10. What is your sex?
   o Female
   o Male

11. Have you heard about human papillomavirus (HPV) before this questionnaire?
   o Yes
   o No

12. Have you heard about the vaccine for human papillomavirus (HPV), also known as Gardasil or Cervarix, before this questionnaire?
   o Yes
   o No

13. What is your age?
   o 18
   o 19
   o 20
   o 21
   o 22
   o 23
   o 24
   o 25
   o 26

14. Have you ever had oral, anal, or vaginal sex?
   o Yes
   o No

15. Do you consider yourself:
   o Heterosexual or straight
   o Gay or lesbian
   o Bisexual
   o Asexual
   o Other: ________

16. What is your academic standing?
   o Freshman
   o Sophomore
   o Junior
   o Senior
   o Graduate student

17. Are you of Hispanic, Latino, or Spanish origin?
   o Yes
   o No

18. Which race best describes you? Select all that apply.
   o African American
   o Asian
   o Caucasian
   o American Indian/Alaska Native
   o Native Hawaiian/Pacific Islander
   o More than one race
   o Other: ___________________(Please write)

Thank you for your time and participation in this study!
Appendix B

Copy of Letter of Approval from University of Alabama Institutional Review Board to Conduct Pilot and Qualitative Salient Elicitation Study (Reformatted to Fit on the Page)
July 30, 2014

Hannah Priest  
Dept. of Health Sciences  
College of Human Environmental Sciences  
Box 870311

Re: IRB # 14-OR-277-ME, “Eliciting College Students’ Salient Beliefs about Human Papillomavirus (HPV) Vaccination”

Dear Ms. Priest:

The University of Alabama Institutional Review Board has granted approval for your proposed research.

Your application has been given expedited approval according to 45 CFR part 46. You have also been granted the requested waiver of informed consent. Approval has been given under expedited review category 7 as outlined below:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Your application will expire on July 29, 2015. If your research will continue beyond this date, please complete the relevant portions of the IRB Renewal Application. If you wish to modify the application, please complete the Modification of an Approved Protocol form. Changes in this study cannot be initiated without IRB approval, except when necessary to eliminate apparent immediate hazards to participants. When the study closes, please complete the Request for Study Closure form.

Please use reproductions of the IRB approved stamped participant information sheets.

Should you need to submit any further correspondence regarding this proposal, please include the above application number.

Good luck with your research.

Sincerely,

[Signature]

Director & Research Compliance Officer  
Office for Research Compliance  
The University of Alabama
Appendix C

Information Sheet for Research: Pilot and Qualitative Salient Elicitation Study
(Note: Reformatted to fit contents on page)
Information Sheet for Research
Principal Investigator: Hannah M. Priest, MAED (Doctoral candidate)
Faculty Advisors: David A. Birch, MCHES, Ph.D. and Adam P. Knowlden, CHES, Ph.D
Department of Health Science
The University of Alabama

Introduction: You are being asked to take part in a research study. Please read this sheet carefully and ask questions about anything that you do not understand. This study is called Eliciting College Students’ Salient Beliefs about Human Papillomavirus (HPV) Vaccination. Hannah Priest, a graduate student at the University of Alabama, is conducting the study.

Is the researcher being paid for this study?
The researcher is receiving no funding for this study.

Is this research developing a product that will be sold, and if so, will the investigator profit from it? No, this research is not developing a product that will be sold.

Does the investigator have any conflict of interest in this study?
The researcher has no conflict of interest to disclose.

What is this study about? What is the investigator trying to learn?
The purpose of this research study is: (1) to determine college students’ opinions about getting the human papillomavirus (HPV) vaccine, and (2) to develop questions for a quantitative instrument to predict HPV vaccination intentions among college students.

Why is this study important or useful?
This knowledge is important because personal opinions about the HPV vaccine can influence vaccination intentions and uptake. The results may help health education researchers develop more effective interventions to increase HPV vaccination intentions in college students.

What will I be asked to do in this study?
If you meet the criteria listed above and agree to be in this study, you will be asked to:
• If you are recruited in phase 1, you will be asked to complete a 22-item questionnaire regarding your opinions about getting the HPV vaccine. The questionnaire contains 13 open-ended questions and 9 demographic questions.
• If you are recruited in phase 2, you will be asked to complete an 18-item questionnaire about your opinions about getting the HPV vaccine. The questionnaire contains 9 open-ended questions and 9 demographic questions.

Why have I been asked to be in this study?
You have been asked to be in this study because HPV is an important health issue for college students.

To be in this study you must be:
(1) A student at The University of Alabama
(2) Between 18 and 26 years of age
(3) Who has not received any doses of the HPV vaccine
(4) And who speaks and understands English

How many people will be in this study?
Approximately 10 college males and 10 college females will participate in phase 1 of this study. Approximately 25 college males and 25 college females will participate in phase 2 of this study. About 70 college males and females total will participate in this study.

How much time will I spend being this study?
• If you are involved with phase 1, you will be asked to complete a 22-item questionnaire one time, which is expected to take approximately 25 minutes to complete. The entire study will take approximately 30 minutes of your time.
• If you are involved in phase 2, you will be asked to complete an 18-item questionnaire one time, which is expected to take approximately 20 minutes to complete. The entire study will take approximately 25 minutes of your time.

Will I be compensated for being in this study?
The only cost to you from this study is your time.

Will I be compensated for being in this study?
You will not be compensated for participating in this research study.

What are the risks (dangers or harms) to me if I am in this study?
There are no physical risks or discomforts in this study. The minimal likelihood of discomfort is not greater than what you would ordinarily encounter in daily life or during routine survey research. Should you experience such discomfort, we will inform you about counseling services offered by the University of Alabama Counseling Center.

What are the benefits (good things) that may happen if I am in this study?
You may receive up to 5 points in extra credit towards the course in which you were recruited to complete the questionnaire. Participation in this study may increase your awareness of and knowledge about the HPV vaccine.

What are the benefits to science or society?
Findings from this study may be used to help design health education and promotion interventions to increase HPV vaccine uptake in college students. As a result, society could benefit from a lower prevalence of HPV infection and associated diseases.

How will my privacy be protected?
You do not have to answer any question that you do not want to. If you feel uncomfortable completing the survey during class time, you can take it in the private office of Ms. Priest. Please alert the researcher if you would like this option.
How will my confidentiality be protected?
To receive extra credit for completion of either of the surveys, you must print your first and last name, along with your instructor’s name, course title, and section number on page 4 of this packet. However, your name will remain confidential. Your name will only be collected to ensure that you receive the incentive (bonus points). The results of the study may be presented or published for scientific purposes; however, the information you provide cannot be linked to you. Please note you do not have to accept the extra credit to participate in this study, in which case you do not have to provide your name.

What are the alternatives to being in this study? Do I have other choices?
You have two alternatives to being in this study. The first is not to participate. The second is to complete a designated alternative assignment. The alternative assignment entails reviewing an article on healthy sleep, and responding to 9 multiple choice, true/false, fill-in-the-blank, and open-ended questions. If you wish to complete the alternative assignment, please inform the principal investigator.

What are my rights as a participant in this study?
Taking part in this study is voluntary. It is your free choice. You can refuse to participate in this study. You may start and then change your mind and stop at any time. There will be no effect on your relations with the University of Alabama.

The University of Alabama Institutional Review Board (“the IRB”) is the committee that protects the rights of people in research studies. The IRB may review study records from time to time to be sure that people in research studies are being treated fairly and that the study is being carried out as planned.

Who do I call if I have questions or problems?
If you have questions, concerns, or complaints about the study right now, please ask them. If you have questions, concerns, or complaints about the study later on, please call Hannah Priest at (205) 348-1625.

If you have questions about your rights as a person in a research study, call Ms. Tanta Myles, the Research Compliance Officer of the University, at 205-348-8461 or toll-free at 1-877-820-3086.

You may also ask questions, make suggestions, or file complaints and concerns through the IRB Outreach website at http://osp.ua.edu/site/PRCO_Welcome.html or email the Research Compliance office at participantoutreach@bama.ua.edu.

After you participate, you are encouraged to complete the survey for research participants that is online at the outreach website or you may ask the investigator for a copy of it and mail it to the University Office for Research Compliance, Box 870127, 358 Rose Administration Building, Tuscaloosa, AL 35487-0127.

"BY COMPLETING THE SURVEY, YOU INDICATE CONSENT FOR YOUR ANSWERS TO BE USED IN THIS RESEARCH STUDY."

PLEASE KEEP THIS INFORMATION SHEET FOR YOUR RECORDS.
Appendix D

Alternative Activity Questions for Pilot and Qualitative Salient Elicitation Study
(*Note: Only two pages of activity provided to conserve space)
Alternative Assignment: Healthy Sleep

Instructions: After reading the passage, please respond to the 9 questions below.

1. The average adult needs approximately ____ hours of sleep each night.

2. Studies show that not getting enough sleep or getting poor quality sleep on a regular basis can increase a person's risk of:
   A. Heart disease
   B. High blood pressure
   C. Diabetes
   D. HIV
   E. All of the above are correct
   F. Only A, B, and C are correct
   G. Only A and C are correct
   H. None of the above are correct

3. _____ True or False: Studies have found that the more people sleep, the more likely they are to be overweight or obese.

4. _____ True or False: Cutting back sleep by even 1 hour can make it difficult to function the next day and can slow your response time.

5. _____ True or False: People who chronically lack sleep are more likely to become depressed.

6. All of the following are strategies to help people get a good night's sleep except:
   A. Exercising 30 minutes per day.
   B. Avoid caffeine and alcohol.
   C. Not taking naps after 3 p.m.
   D. Eating a large meal for a late dinner.
   E. Keep the temperature in your bedroom cool.

7. How sleepy are you? The Epworth Sleepiness Scale is an informal sleep latency test that can help you evaluate how sleepy you are during the day, a key symptom of many sleep disorders. To evaluate your daytime sleepiness, use the scale from 0 to 3 to rate how likely you would be to doze off in the situations listed here.

<table>
<thead>
<tr>
<th>Situation</th>
<th>Chance of Dozing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sitting and reading</td>
<td></td>
</tr>
<tr>
<td>Watching television</td>
<td></td>
</tr>
<tr>
<td>Sitting inactive in a public place (for example, a theater or a meeting)</td>
<td></td>
</tr>
<tr>
<td>Riding in a car for an hour without a break</td>
<td></td>
</tr>
<tr>
<td>Lying down in the afternoon</td>
<td></td>
</tr>
<tr>
<td>Sitting and talking to someone</td>
<td></td>
</tr>
<tr>
<td>Sitting quietly after lunch (when you have had no alcohol)</td>
<td></td>
</tr>
</tbody>
</table>

   Please continue to the next page...

8. Reflect on your sleep over the last 7 days. Approximately how many hours did you sleep each night? Discuss the factors (individual and environmental) that affected the duration or quality of your sleep. For example, perhaps you slept worse on the days you drank coffee/energy soda after dinner, or perhaps you slept worse on the weekend because your neighbors had a noisy party. Conversely, perhaps you slept well because you didn't play video games before going to sleep or because your partner goes to sleep and wakes up at the same time you do.

9. Overall, do you think you are meeting your sleep needs? Why or why not? If you are not meeting your sleep needs, what are some things you can do to change this?
Appendix E

Qualitative Salient Elicitation Content Analysis

Qualitative Salient Elicitation Study Results (n = 30)

<table>
<thead>
<tr>
<th>Pre-determined Codes and Corresponding Questions</th>
<th>Verbatim responses</th>
<th>Frequent responses*</th>
<th>Themes extracted</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attitude Toward Behavior</strong></td>
<td>1. What do you believe are the advantages of getting all three doses of the HPV vaccine in the next 12 months?</td>
<td></td>
<td>Protection/The HPV vaccine protects against HPV</td>
</tr>
<tr>
<td></td>
<td>• Protection against HPV</td>
<td>• Protection against HPV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• No contracting HPV, taking necessary precautions to remain safe sexually</td>
<td>• ...and protects you</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• I think it could keep you safer from getting a disease</td>
<td>• To be protected against the human papillomavirus during sexual encounters</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• It keeps you healthy</td>
<td>• It could help protect against the disease</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• ...and protects you</td>
<td>• No contracting HPV, taking necessary precautions to remain safe sexually</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• The advantages are that it could provide you extra support in your body’s immune system for fighting the disease</td>
<td>• You’ll be less likely to contract HPV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• To be protected against the human papillomavirus during sexual encounters</td>
<td>• That I won’t catch HPV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• You’ll be less likely to contract HPV</td>
<td>• Not contracting HPV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• That I won’t catch HPV</td>
<td>• So that you won’t get HPV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Healthier sex life, ...</td>
<td>• To have the best protection against HPV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• ...keeping yourself and others out of harm’s way of sexual diseases</td>
<td>• Have less risk of getting the disease</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Not contracting HPV</td>
<td>• You are less prone to getting HPV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• It could help protect against the disease</td>
<td>• A preventative measure to not get HPV</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• You cannot receive human papillomavirus</td>
<td></td>
</tr>
<tr>
<td>Advantage</td>
<td>Advantage</td>
<td>Advantage</td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>• So that you won’t get HPV</td>
<td>• It can prevent almost HPV</td>
<td>• Obviously becoming immune to the HPV virus…</td>
<td></td>
</tr>
<tr>
<td>• Allows them to work together</td>
<td>• Prevention of an infection</td>
<td>• ...Also peace of mind that you don’t have to worry about HPV</td>
<td></td>
</tr>
<tr>
<td>• To have the best protection against HPV</td>
<td>• I would say the main advantage would be getting all the doses as soon as possible helps protect students exposed to or partaking in sexual activity on a frequent basis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Obviously becoming immune to the HPV virus…</td>
<td>• More protection...</td>
<td>• By taking the shots it should greatly reduce the amount of sexually transmitted infections</td>
<td></td>
</tr>
<tr>
<td>• ...Also peace of mind that you don’t have to worry about HPV</td>
<td>• To prevent HPV infections</td>
<td>• Have less risk of getting the disease</td>
<td></td>
</tr>
<tr>
<td>• By taking the shots it should greatly reduce the amount of sexually transmitted infections</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Have less risk of getting the disease</td>
<td>• I believe that the advantage of the HPV vaccine is to better protect someone from a sexually harmful infection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• You are less prone to getting HPV</td>
<td>• It betters your chance of being HPV free</td>
<td>• Obviously becoming immune to the HPV virus (n = 22)</td>
<td></td>
</tr>
<tr>
<td>• I would say the main advantage would be getting all the doses as soon as possible helps protect students exposed to or partaking in sexual activity on a frequent basis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• To ensure that you are healthy...</td>
<td>• It keeps you healthy</td>
<td>• ...and being healthy (n = 4)</td>
<td></td>
</tr>
<tr>
<td>• ...and do not have a disease and if you do not test positive you have an early detection and can get help</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• A preventative measure to not get HPV</td>
<td>• Healthier sex life...</td>
<td>• By taking the shots it should greatly reduce the amount of sexually transmitted infections</td>
<td></td>
</tr>
<tr>
<td>• You cannot receive human papillomavirus</td>
<td>• To ensure that you are healthy...</td>
<td>• ...keeping yourself and others out of harm’s way of sexual diseases (n = 2)</td>
<td></td>
</tr>
<tr>
<td>• It can prevent almost HPV</td>
<td>• ...and being healthy (n = 4)</td>
<td>• The advantages are that it could provide you extra support in your body’s immune system for fighting the disease (n = 1)</td>
<td></td>
</tr>
<tr>
<td>• Prevention of an infection</td>
<td>• More protection...</td>
<td>• Obviously becoming immune to the HPV virus…(n = 1)</td>
<td></td>
</tr>
<tr>
<td>• More protection...</td>
<td>• ...and being healthy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• ...and being healthy</td>
<td>• By taking the shots it should greatly reduce the amount of sexually transmitted infections</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• I do not know enough about the vaccine to know why it takes three shots so I would not know any advantages for it</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Obviously becoming immune to the HPV virus...</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. What do you believe are the disadvantages of getting all three doses of the HPV vaccine in the next 12 months?

<table>
<thead>
<tr>
<th>Disadvantages</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>May not be able to afford the shots</td>
<td>2</td>
</tr>
<tr>
<td>Shots may be painful</td>
<td>1</td>
</tr>
<tr>
<td>Temporary discomfort</td>
<td>1</td>
</tr>
<tr>
<td>Inconvenience</td>
<td>1</td>
</tr>
<tr>
<td>The shots are probably expensive...</td>
<td>1</td>
</tr>
<tr>
<td>...and some don’t need them</td>
<td>1</td>
</tr>
<tr>
<td>Have to get a shot</td>
<td>1</td>
</tr>
<tr>
<td>I don’t believe there are any disadvantages</td>
<td>1</td>
</tr>
<tr>
<td>I do not think there are any disadvantages to getting the HPV vaccine</td>
<td>1</td>
</tr>
<tr>
<td>May not be able to afford the shots</td>
<td>1</td>
</tr>
<tr>
<td>The shots are probably expensive...</td>
<td>1</td>
</tr>
<tr>
<td>...and may be costly to some</td>
<td>1</td>
</tr>
<tr>
<td>Cost of vaccination</td>
<td>1</td>
</tr>
<tr>
<td>Cost money</td>
<td>1</td>
</tr>
<tr>
<td>I believe the disadvantages would be the cost of the doses</td>
<td>6</td>
</tr>
<tr>
<td>I don’t believe there are any disadvantages</td>
<td>1</td>
</tr>
<tr>
<td>I do not think there are any disadvantages to getting the HPV vaccine</td>
<td>1</td>
</tr>
<tr>
<td>Cost/HPV vaccine is costly</td>
<td>1</td>
</tr>
<tr>
<td>No disadvantages to getting HPV vaccine</td>
<td>1</td>
</tr>
</tbody>
</table>
• I’m not informed enough to know disadvantages might exist,…
• …other than you may have a larger chance of contracting HPV
• Possibly put a strain on your body
• If you don’t have sex then there is no point to take the vaccine.
• Time consuming…
• …and may be costly to some
• Cost of vaccination
• It could be time consuming
• Shots suck
• Cost money
• I don’t believe there are any disadvantages
• I don’t know how there could possibly be any disadvantages…
• …unless you are deathly afraid of needles
• The constant shots could have negative feedback from several students. Each body may react in a different way. Some people may become unhealthy from the shot
• Run a higher risk of catching it
• Taking time to schedule an appointment to receive the vaccines
• The disadvantages would be knowing you have a disease from sex…
• …and then having to go plan to get the vaccine 3 times a year
• I don’t really see any disadvantage with getting all three in a 12 month period (n = 5)
• Inconvenience
• …and then having to go plan to get the vaccine 3 times a year (n = 2)
• None except for not liking
• I don’t believe there are any disadvantages
• I don’t know how there could possibly be any disadvantages…
• I don’t really see any disadvantage with getting all three in a 12 month period
• Time consuming…
• It could be time consuming
• Taking time to schedule an appointment to receive the vaccines
• It takes up your time if you don’t really need it (n = 4)
• Have to get a shot
• …unless you are deathly afraid of needles
• None except for not liking needles (n = 3)
• Shots may be painful
• Temporary discomfort
• The pain of the shot (n = 3)
• …other than you may have a larger chance of contracting HPV
• Run a higher risk of catching it
• Not being protected of diseases (n = 3)
• …and some don’t need them
• If you don’t have sex then there is no point to take the vaccine. (n = 2)
• Convenience
• …and then having to go plan to get the vaccine 3 times a year (n = 2)
• Getting the HPV vaccine is time consuming
• Unpleasant/Getting HPV shots would be unpleasant
• Painful/Getting the HPV vaccine would be painful
• N/A – misconceptions
• Unnecessary/Getting the HPV vaccine is unnecessary for some
• Getting the HPV
needles
• It takes up your time if you don’t really need it
• It still have some HPV vaccine doesn’t work for HPV
• The pain of the shot
• Not being protected of diseases
• Same answer as question one. I’ll also add that taking three doses might be difficult for someone to do depending on their work or everyday schedule.
• I don’t know
• I believe the disadvantages would be the cost of the doses.
• That the individual has HPV and needs shots because of it

• Possibly put a strain on your body
• The constant shots could have negative feedback from several students. Each body may react in a different way. Some people may become unhealthy from the shot (n = 2)
• The disadvantages would be knowing you have a disease from sex...
• That the individual has HPV and needs shots because of it (n = 2)
• Whether it would conflict with my basketball, college and travel life
• Same answer as question one. I’ll also add that taking three doses might be difficult for someone to do depending on their work or everyday schedule. (n = 2)

• I’m not informed enough to know disadvantages might exist,…(n = 1)

• Shots suck (n = 1)
• It still have some HPV vaccine doesn’t work for HPV (n = 1)
• I don’t know (n = 1)

<table>
<thead>
<tr>
<th>3. Is there anything else you associate with your own views about getting all three doses of the HPV vaccine in the next 12 months?</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Receiving the vaccine may promote pre-marital sex as people feel less at risk to contract an STI</td>
</tr>
<tr>
<td>• No</td>
</tr>
<tr>
<td>• I think it might be a good idea for some</td>
</tr>
<tr>
<td>• I’m not a fan of vaccines and antibiotics, etc. I like my own immune</td>
</tr>
</tbody>
</table>

| • No/None that I can think of (n = 16) |
| • If I was more informed about the HPV virus maybe I would not be as hesitant |
| • I don’t know HPV much |
| • N/A – respondents did not expand |

- Respondents lack knowledge about HPV virus and HPV vaccine
- Some people may have negative reactions to the HPV vaccine shots
- N/A – misconceptions
I believe any sort of medicine out there whether it’s in multiple doses or one is beneficial to you and the faster you get them the better.

Many people I know have received the vaccine, but I have also never heard of anyone catching HPV without it.

No

If I was more informed about the HPV virus maybe I would not be as hesitant.

None that I can think of

No

I think this is a good idea

No

Nope

No

Nope

I don’t like shots, I wouldn’t torture myself like that. I would have the safest sex possible.

No

It would be beneficial

No my views are if you make a mistake then move on

Only that the decision comes down to the individual

I think that with anything as serious as sexually transmitted diseases that it is crucial to protect and cure as early as you can in the stage.

No...

...I think it is a good idea to get it

No

I don’t know HPV much

No...

I don’t know enough to form a strong reason  \(n = 3\)

I think it might be a good idea for some

I think this is a good idea

...I think it is a good idea to get it

It would be beneficial  \(n = 4\)

I think that with anything as serious as sexually transmitted diseases that it is crucial to protect and cure as early as you can in the stage.

I hope I never have to get the shots due to possible HPV symptoms  \(n = 2\)

I believe any sort of medicine out there whether it’s in multiple doses or one is beneficial to you and the faster you get them the better  \(n = 1\)

Receiving the vaccine may promote pre-marital sex as people feel less at risk to contract an STI  \(n = 1\)

I’m not a fan of vaccines and antibiotics, etc. I like my own immune system to take care of things  \(n = 1\)

Many people I know have received the vaccine, but I have also never heard of anyone catching HPV without it  \(n = 1\)

...I should just get the shot  \(n = 1\)

Getting the HPV vaccine is a good idea

N/A - misconceptions
<table>
<thead>
<tr>
<th>Subjective Norm</th>
<th>4. Are there any individuals or groups who would approve (directly or indirectly) of your getting all three doses of the HPV vaccine in the next 12 months?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Parents</td>
</tr>
<tr>
<td></td>
<td>• My parents might approve but concerned at the same time</td>
</tr>
<tr>
<td></td>
<td>• My parents...</td>
</tr>
<tr>
<td></td>
<td>• My mother</td>
</tr>
<tr>
<td></td>
<td>• Prob father who is in medical field (n = 9)</td>
</tr>
<tr>
<td></td>
<td>• Family</td>
</tr>
<tr>
<td></td>
<td>• If it were to protect me I feel like my family and...</td>
</tr>
<tr>
<td></td>
<td>• “Approvement” would come from family/...</td>
</tr>
<tr>
<td></td>
<td>• Yes, family</td>
</tr>
<tr>
<td></td>
<td>• ...and family would approve of me receiving the HPV vaccine</td>
</tr>
<tr>
<td></td>
<td>• Family members that care for my best interest would approve of getting the doses (n = 6)</td>
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<td></td>
<td>• Friends</td>
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<td></td>
<td>• ...and friends would approve if I did</td>
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<td></td>
<td>• ...friends would support my decision</td>
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<td></td>
<td>• Parents would approve of getting HPV vaccine</td>
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<td></td>
<td>• Parents</td>
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<td></td>
<td>• My parents would approve</td>
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<td></td>
<td>• Most likely my mother and father</td>
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<td>• My parents...</td>
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<td></td>
<td>• My mother</td>
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<tr>
<td></td>
<td>• Prob father who is in medical field (n = 9)</td>
</tr>
<tr>
<td></td>
<td>• Family</td>
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<tr>
<td></td>
<td>• If it were to protect me I feel like my family and...</td>
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<tr>
<td></td>
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<td></td>
<td>• Parents</td>
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<td></td>
<td>• My parents might approve but concerned at the same time</td>
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<td></td>
<td>• My parents...</td>
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<td></td>
<td>• My mother</td>
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<td>• ...and friends would approve if I did</td>
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<td></td>
<td>• ...friends would support my decision</td>
</tr>
<tr>
<td></td>
<td>• Parents would approve of getting HPV vaccine</td>
</tr>
</tbody>
</table>

205
My mother
My family and friends would hopefully support me if I were to need the vaccine
"Approvement" would come from family/
.../Friends who want myself to be safe...
...Also most other parties who have experienced college life.
Potentially most of my family but I am not sure. Just depends on how well they have been educated in Australia
Yes, I think everyone would approve
Yes
(Blank)
Most likely my mother and father
No
I'm sure there would be
I don't know
My parents...
...and family would approve of me receiving the HPV vaccine
Family members that care for my best interest would approve of getting the doses

.../Friends who want myself to be safe...(n = 4)
Not that I can think of
Nope
No
No (n = 4)
Yes
Yes (n = 2)
Possibly parents if they knew (n = 1)
Potentially most of my family but I am not sure. Just depends on how well they have been educated in Australia (n = 1)
Yes, I think everyone would approve (n = 1)
Fraternities would approve and so would sororities (n = 1)
I think a lot of college kids would approve. I don’t know about groups of people though (n = 1)
People or students who are sexually active would like it because it adds more protection (n = 1)
...Also most other parties who have experienced college life. (n = 1)
I'm sure there would be (n = 1)
I don't know (n = 1)

No individuals or groups would approve of college males getting HPV vaccine
N/A – there are individuals or groups who would approve of college males getting HPV vaccine; however, respondents did not expand
<table>
<thead>
<tr>
<th>5. Are there any individuals or groups who would disapprove (directly or indirectly) of your getting all three doses of the HPV vaccine in the next 12 months?</th>
</tr>
</thead>
<tbody>
<tr>
<td>- My parents</td>
</tr>
<tr>
<td>- No</td>
</tr>
<tr>
<td>- My friends would think it was dumb to get the shots</td>
</tr>
<tr>
<td>- (Blank)</td>
</tr>
<tr>
<td>- No one would disapprove</td>
</tr>
<tr>
<td>- Not that I know of</td>
</tr>
<tr>
<td>- No</td>
</tr>
<tr>
<td>- Friends, “just use a condom” &lt;- their response</td>
</tr>
<tr>
<td>- No</td>
</tr>
<tr>
<td>- Not that I know of</td>
</tr>
<tr>
<td>- I have no idea</td>
</tr>
<tr>
<td>- Some of my friends because they would be mad about me having sex</td>
</tr>
<tr>
<td>- My parents</td>
</tr>
<tr>
<td>- No</td>
</tr>
<tr>
<td>- I do not believe so</td>
</tr>
<tr>
<td>- People who are not very sexually active may have side effects that could have been avoided</td>
</tr>
<tr>
<td>- No</td>
</tr>
<tr>
<td>- None that I can think of</td>
</tr>
<tr>
<td>- I think anyone who I just met would be skeptical if they knew I had to get three vaccines.</td>
</tr>
<tr>
<td>- The only groups I could see disapproving on my account would be certain religious friends/...</td>
</tr>
<tr>
<td>- .../religious groups/... (n = 2)</td>
</tr>
<tr>
<td>- I have no idea (n = 1)</td>
</tr>
<tr>
<td>- People who are not very sexually active may have side effects that could have been avoided (n = 1)</td>
</tr>
<tr>
<td>- Some of my friends because they would be mad about me having sex (n = 3)</td>
</tr>
<tr>
<td>- My parents</td>
</tr>
<tr>
<td>- My parents (n = 2)</td>
</tr>
<tr>
<td>- ...anti-vaccination groups</td>
</tr>
<tr>
<td>- ...and anti-vaccination friends/... (n = 2)</td>
</tr>
<tr>
<td>- People who are religious would disapprove of getting HPV vaccine</td>
</tr>
<tr>
<td>- Parents would disapprove of getting HPV vaccine</td>
</tr>
<tr>
<td>- People who are anti-vaccination would disapprove of getting HPV vaccine</td>
</tr>
<tr>
<td>- People who are religious would disapprove of getting HPV vaccine</td>
</tr>
<tr>
<td>- Yes, my athletic trainer might</td>
</tr>
<tr>
<td>- No individuals or groups would disapprove of getting HPV vaccine</td>
</tr>
<tr>
<td>- Friends would disapprove of getting HPV vaccine</td>
</tr>
<tr>
<td>- People who are religious would disapprove of getting HPV vaccine</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>----</td>
</tr>
<tr>
<td>Not to my knowledge</td>
</tr>
<tr>
<td>Yes, my athletic trainer might depending on does the vaccine supplement... Is there any banned supstude (sp) in it?</td>
</tr>
<tr>
<td>I’m sure there would be</td>
</tr>
<tr>
<td>Only people that I don’t care what they think</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>No, as long as the vaccine is effective and is necessary</td>
</tr>
</tbody>
</table>

6. *Is there anything else you associate with other people's views about you getting all three doses of the HPV vaccine in the next 12 months?*

<table>
<thead>
<tr>
<th>(Blank)</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Some people may think if you go get one then you are looked down on</td>
<td>No/Nope/No because others could need the vaccine in necessary</td>
</tr>
<tr>
<td>(Blank)</td>
<td>I honestly don’t care about people's views if it's about my health</td>
</tr>
<tr>
<td>There is nothing now that I can associate when it comes to other's views on it</td>
<td>Not particularly as it is my views that matter in the end</td>
</tr>
<tr>
<td>I feel like people may view you as being overly sexually active</td>
<td>Some people may think if you go get one then you are looked down on</td>
</tr>
<tr>
<td>No</td>
<td>Some people may think if you go get one then you are looked down on</td>
</tr>
<tr>
<td>I honestly don’t care about people’s views if it’s about my health</td>
<td>There is nothing now that I can associate when it comes to other’s views on it</td>
</tr>
<tr>
<td>No</td>
<td>I feel like people may view you as being overly sexually active</td>
</tr>
<tr>
<td>No</td>
<td>Some people may have caution with the number of doses and evidence to how well it works.</td>
</tr>
<tr>
<td>No</td>
<td>I don’t know</td>
</tr>
<tr>
<td>Nothing that I can think of</td>
<td>N/A – respondents did not expand</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>College males are only concerned with their personal views about getting the HPV vaccine</td>
</tr>
</tbody>
</table>
7. What factors or circumstances would make it easy or enable you to get all three doses of the HPV vaccine in the next 12 months?

<table>
<thead>
<tr>
<th>Perceived Behavioral Control</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Offer the vaccination at the student health center</strong></td>
</tr>
<tr>
<td><strong>Make it affordable...</strong></td>
</tr>
<tr>
<td><strong>...and easily accessible</strong></td>
</tr>
<tr>
<td><strong>No prior appointments with the doctor</strong></td>
</tr>
<tr>
<td><strong>Benefits being what they are</strong></td>
</tr>
<tr>
<td><strong>If it were made mandatory for students to have</strong></td>
</tr>
<tr>
<td><strong>HPV scare in Alabama</strong></td>
</tr>
<tr>
<td><strong>I think going to the doctor more regularly would make it easy</strong></td>
</tr>
<tr>
<td><strong>Someone I know contracting the disease</strong></td>
</tr>
<tr>
<td><strong>My family would just help me get it</strong></td>
</tr>
<tr>
<td><strong>If it doesn’t make me sick...</strong></td>
</tr>
<tr>
<td><strong>...[If it doesn’t make me]...away from work or school</strong></td>
</tr>
<tr>
<td><strong>Affordable...</strong></td>
</tr>
<tr>
<td><strong>...quick...</strong></td>
</tr>
<tr>
<td><strong>If it fit in my time frame of free time</strong></td>
</tr>
<tr>
<td><strong>A light schedule</strong></td>
</tr>
<tr>
<td><strong>Scheduling dates to the best time for students where they could receive the shots in a safe, reliable location</strong></td>
</tr>
<tr>
<td><strong>3 designated days over 12 months, mainly to be able to plan my schedule around them</strong></td>
</tr>
<tr>
<td><strong>...at a flexible time</strong></td>
</tr>
<tr>
<td><strong>Making time to go get the vaccination (n = 6)</strong></td>
</tr>
<tr>
<td><strong>Make it affordable</strong></td>
</tr>
<tr>
<td><strong>Affordable...</strong></td>
</tr>
<tr>
<td><strong>Price</strong></td>
</tr>
<tr>
<td><strong>If it was free...</strong></td>
</tr>
<tr>
<td><strong>If it was cheap to get it (n = 5)</strong></td>
</tr>
<tr>
<td><strong>If I learned about it more</strong></td>
</tr>
<tr>
<td><strong>So that I know I won’t get HPV</strong></td>
</tr>
<tr>
<td><strong>Having time to get the HPV vaccine would make it easy/enable college males to get HPV vaccine</strong></td>
</tr>
<tr>
<td><strong>Making the HPV vaccine affordable would make it easy/enable college males to get HPV vaccine</strong></td>
</tr>
<tr>
<td><strong>Having more info would make it easy/enable college males to get HPV vaccine</strong></td>
</tr>
</tbody>
</table>
• ...and easy
• Quick, [vaccination]...
• ...easy vaccination
• ...at a flexible time
• If I learned about it more
• If it was cheap to get it
• So that I know I won’t get HPV
• If I was sexually active
• If the student health center offered all three doses of the HPV vaccine, it would be easier for me to get them
• If it was free...
• ...And given without the use of needles
• Scheduling dates to the best time for students where they could receive the shots in a safe, reliable location
• Participating in this study
• If it fit in my time frame of free time
• It would make it easier if the vaccine came to me when it was time to get it, so it could be more secretive
• 3 designated days over 12 months, mainly to be able to plan my schedule around them
• A light schedule
• More supporting research and evidence that it is healthy and works
• If I got the HPV virus
• Making time to go get the vaccination
• (Blank)
• Price
• Nothing
• Time off work
• 3 national vaccination days off
• This class – having it as extra credit

• More supporting research and evidence that it is healthy and works (n = 3)
• ...and easily accessible
• Factors that would make it easy for me to get the doses would be to make them easily accessible (n = 2)

• Offer the vaccination at the student health center
• If the student health center offered all three doses of the HPV vaccine, it would be easier for me to get them (n = 2)

• ...quick...
• Quick, [vaccination] ...(n = 2)

• ...and easy (n = 1)

• easy vaccination (n = 1)

• Participating in this study (n = 1)

• This class – having it as extra credit (n = 1)

• No prior appointments with the doctor (n = 1)

• Benefits being what they are (n = 1)

• If it were mandatory for students to have (n = 1)

• HPV scare in Alabama (n = 1)
Factors that would make it easy for me to get the doses would be to make them easily accessible

Having the means of trained medical personnel makes it easy

I think going to the doctor more regularly would make it easy (n = 1)

Someone I know contracting the disease (n = 1)

My family would just help me get it (n = 1)

If I was sexually active (n = 1)

...And given without the use of needles (n = 1)

It would make it easier if the vaccine came to me when it was time to get it, so it could be more secretive (n = 1)

If I got the HPV virus (n = 1)

Nothing (n = 1)

3 national vaccination days off (n = 1)

Having the means of trained medical personnel makes it easy (n = 1)

If it doesn’t make me sick

[If it doesn’t make me]...away from work or school (n = 1)

Time off work (n = 1)
8. What factors or circumstances would make it difficult or impossible for you to get all three doses of the HPV vaccine in the next 12 months?

- If the vaccinations were expensive
- Require multiple prior appointments with the doctor
- Inconvenience
- Depending on the price of each shot
- If I became celibate
- One factor that would make it hard is just totally avoiding the issue of catching an STD
- None that I can think of
- There are none
- If it is possible to catch this virus from the vaccination...
- ...Or stops me from work
- Money isn’t really an issue, would be good if insurance helped though
- Costly
- Cost...
- ...Or it interferes with a class
- My time
- People would look down on me
- My parents
- If the student health center didn’t offer all three doses of the HPV vaccine it would make it difficult for me to get them
- I had to pay...
- ...Or go somewhere that was inconvenient
- The time between shots. If I get one in the spring and fall semester, how can I make sure my dosage is the same while I’m away for the summer?
- Time management with school and other activities

- If the vaccinations were expensive
- Being too expensive is one factor that would make it difficult
- Possibly not being able to afford getting the doses for HPV
- Costly
- Cost...
- Depending on the price of each shot
- Price...
- Money isn’t really an issue, would be good if insurance helped though
- I had to pay... (n = 9)
- ...Or if it interferes with a class
- Conflicting circumstances like class or other obligations I’ve made in the past
- Taking 16 hours of classes...
- Time management with school and other activities
- My time (n = 5)
- None that I can think of
- There are none
- I don’t see anything making too difficult or impossible (n = 3)

- Inconvenience
- ...Or go somewhere that was inconvenient (n = 2)

- Inconvenience
- ...Or stops me from work
- ...Working 40 hours a week... (n = 2)

- Being expensive would make it difficult or impossible to get HPV vaccine

- Busy class schedules would make it difficult or impossible for college males to get HPV vaccine

- No factors or circumstances that would make it difficult for college males to get HPV vaccine

- Inconvenience would make it difficult or impossible for college males to get HPV vaccine

- Working would make it difficult or impossible for college males to get HPV vaccine

- The pain of the shot
• If I had to travel because I do not have a vehicle
  • Everyday life can get in the way and make you forget about getting it...
  • ...Or listening to other conversations about people’s opinions on sexually transmitted diseases.
  • I don’t see anything making too difficult or impossible
  • Whether my coaches or family have conflicting views on the vaccine or doses
  • Not liking needles or shots
  • Conflicting circumstances like class or other obligations I’ve made in the past
  • (Blank)
  • Price...
  • ...and the pain
  • Nothing
  • Taking 16 hours of classes...
  • ...Working 40 hours a week...
  • ...and playing music on weekends (traveling)
  • If I had HPV...
  • ...or if I was under 18 or over 26
  • Being too expensive is one factor that would make it difficult
  • Possibly not being able to afford getting the doses for HPV
  • Not liking needles or shots
  • ...and the pain (n = 2)
  • People would look down on me (n = 1)
  • ...Or listening to other conversations about people’s opinions on sexually transmitted diseases. (n = 1)
  • Require multiple prior appointments with the doctor (n = 1)
  • If I became celibate (n = 1)
  • One factor that would make it hard is just totally avoiding the issue of catching an STD (n = 1)
  • If it is possible to catch this virus from the vaccination... (n = 1)
  • My parents (n = 1)
  • If the student health center didn’t offer all three doses of the HPV vaccine it would make it difficult for me to get them (n = 1)
  • The time between shots. If I get one in the spring and fall semester, how can I make sure my dosage is the same while I’m away for the summer? (n = 1)
<table>
<thead>
<tr>
<th>Question</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>...or if I was under 18 or over 26 (n = 1)</td>
<td></td>
</tr>
<tr>
<td>If I had HPV... (n = 1)</td>
<td></td>
</tr>
<tr>
<td>...and playing music on weekends (traveling) (n = 1)</td>
<td></td>
</tr>
<tr>
<td>Whether my coaches or family have conflicting views on the vaccine or doses (n = 1)</td>
<td></td>
</tr>
<tr>
<td>Nothing (n = 1)</td>
<td></td>
</tr>
<tr>
<td>If I had to travel because I do not have a vehicle (n = 1)</td>
<td></td>
</tr>
<tr>
<td>Everyday life can get in the way and make you forget about getting it... (n = 1)</td>
<td></td>
</tr>
<tr>
<td>Nothing (n = 1)</td>
<td></td>
</tr>
<tr>
<td>If I had HPV... (n = 1)</td>
<td></td>
</tr>
<tr>
<td>...or if I was under 18 or over 26 (n = 1)</td>
<td></td>
</tr>
</tbody>
</table>

9. Are there any other thoughts or opinions that you would like to share about getting all three doses of the HPV vaccine in the next 12 months?

- (Blank)
- N/A
- It could be helpful...
- ...but also a waste of money
- (Blank)
- None that I can think of
- I feel like if the vaccine is preventing a disease from being spread then it should continue to be offered to the public so people can make their own decision on whether to receive the vaccine or not
- None...
- Inform more people so this question serves a better purpose.
- None
- No
- No
- Not that I know of
- No/Nope/Not that I know of (n = 14)
- I feel like if the vaccine is preventing a disease from being spread then it should continue to be offered to the public so people can make their own decision on whether to receive the vaccine or not
- Inform more people so this question serves a better purpose.
- I would just like to know how serious the HPV virus is and numbers on how many people contract it per year, etc. Just more of a background on what it is and does. I've never heard of it until today.
- N/A – No additional thoughts or opinions to share about getting the HPV vaccine
- More education is needed about HPV and HPV vaccination for college males and the public to get vaccinated
• Nope
• No
• I would just like to know how serious the HPV virus is and numbers on how many people contract it per year, etc. Just more of a background on what it is and does. I’ve never heard of it until today.
• (Blank)
• It will help reduce the spread if it was a mandatory shot
• Nothing that I can think of
• I can only hope the disease doesn’t ruin someone’s life
• I would just need more support, information and evidence
• Seems like getting the shots would be more needed by incoming freshmen
• No
• No
• No thoughts...
• ...besides it’s a good idea
• No
• No
• No
• No
• I don’t see myself getting it soon but if it is something that absolutely needs to be done then I will

• I would just need more support, information and evidence (n = 4)
• It could be helpful...(n = 1)
• …but also a waste of money (n = 1)
• N/A (n = 1)
• It will help reduce the spread if it was a mandatory shot (n = 1)
• I can only hope the disease doesn’t ruin someone’s life (n = 1)
• Seems like getting the shots would be more needed by incoming freshmen (n = 1)
• …besides it’s a good idea (n = 1)
• I don’t see myself getting it soon but if it is something that absolutely needs to be done then I will (n = 1)

Note. *Frequency of responses are listed from most frequently mentioned to least frequently mentioned; Underlined responses indicate respondents’ misconceptions about HPV and the HPV vaccine or a request for additional information about the vaccine. Anytime “get HPV vaccine” is mentioned, this means “get all three doses of HPV vaccine in the next 12 months”.*
Appendix F

Permission to Use American College Health Association – National College Health Assessment II Survey Items

From: Hannah Priest <hmpriest@crimson.ua.edu>
To: mhoban@acha.org
Date: Thursday, September 4, 2014 at 8:50 AM
Subject: Request for Permission to Use/Modify NCHA II Sexual Behavior Items

Greetings,

My name is Hannah M. Priest - I am a doctoral student at The University of Alabama. I am currently working on my dissertation, and would like to use/modify items 19-21 and 41a (only the section about genital warts diagnosis) from the National College Health Assessment II survey. Please let me know if I have permission to use these items and if there is any fee associated with using them.

Best wishes,
Hannah M. Priest

…

From: Mary Hoban <MHoban@acha.org>
To: Hannah Priest <hmpriest@crimson.ua.edu>
Date: Monday, February 23, 2015 at 2:40 PM
Subject: RE: Request for Permission to Use/Modify NCHA II Sexual Behavior Items

Yes, Hannah, you have permission to use the ACHA-NCHA items listed below with a sample of 740 students.

Thanks,
Mary Hoban
Appendix G

Instrument Scoring Guide

**Behavioral intention construct score** is derived from calculating the mean of the item scores (items 1 – 3). The scoring range is from 3 to 21.

**Attitude toward behavior construct score** is derived from calculating the mean of the item scores (items 4 – 10). The scoring range is 7 to 49.

**Perceived behavioral control construct score** is derived from calculating the mean of the item scores (items 15 – 20). The scoring range is 6 to 42.

**Subjective norm construct score** is derived from calculating the mean of the item scores (items 11 – 14). The scoring range is 4 to 28.

**Exclusion criteria:** The first three questions (not numbered) are exclusion criteria. Eligibility of HPV vaccination is limited to 26 years of age. To capture intentions of college males of traditional college-age, students under 18 have been excluded. If respondent has taken any doses of the HPV vaccine, it will bias intention scores.

**Demographic items:** Items 23-27 and 38-40 are demographic questions. Items 21, 22, 28-37, and 41 are for descriptive purposes.

*Note.* TPB rating scales are from 1-7
## Appendix H

### Panel of Expert Profiles

**Panel of Expert Profiles**

<table>
<thead>
<tr>
<th>Name</th>
<th>Position/Affiliation</th>
<th>Email Address</th>
<th>Expertise</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Daniel M. Avery, Jr., MD</td>
<td>Professor and Chair of the Department of Obstetrics and Gynecology; Professor and Division Chief of Pathology in the Department of Surgery; and the Medical Director of the Laboratory at the College of Community Health Sciences, The University of Alabama</td>
<td><a href="mailto:davery@cchs.ua.edu">davery@cchs.ua.edu</a></td>
<td>HPV/HPV Vaccination (Clinician’s Perspective)</td>
</tr>
<tr>
<td>2. Beth H. Chaney, Ph.D.</td>
<td>Assistant Professor, Department of Health Education and Promotion, East Carolina University</td>
<td><a href="mailto:chaneye@ecu.edu">chaneye@ecu.edu</a></td>
<td>Theory/Instrument Development</td>
</tr>
<tr>
<td>3. Richard Crosby, Ph.D.</td>
<td>Professor &amp; Chair, Department of Health Behavior, University of Kentucky</td>
<td><a href="mailto:crosby@uky.edu">crosby@uky.edu</a></td>
<td>Theory/Instrument Development, College Students, HPV/HPV Vaccination</td>
</tr>
<tr>
<td>4. Cleoanne Estrera, RN, MSN, FNP-C</td>
<td>Nurse Practitioner &amp; Women’s Health Coordinator, Student Health Center, Duke University</td>
<td><a href="mailto:cleoanneestrera@duke.edu">cleoanneestrera@duke.edu</a></td>
<td>HPV/HPV Vaccination (Clinician’s Perspective)</td>
</tr>
<tr>
<td>5. William Fisher, Ph.D.</td>
<td>Distinguished Professor, Department of Psychology &amp; Department of Obstetrics and Gynaecology, University of Western Ontario</td>
<td><a href="mailto:fisher@uwo.ca">fisher@uwo.ca</a></td>
<td>Theory/Instrument Development, College Students, HPV/HPV Vaccination</td>
</tr>
<tr>
<td>6. Holly B. Fontenot, Ph.D., RN, WHNP-BC</td>
<td>Assistant Professor of Nursing, William F. Connell School of Nursing, Boston College</td>
<td><a href="mailto:holly.fontenot@bc.edu">holly.fontenot@bc.edu</a></td>
<td>HPV/HPV Vaccination, College Students</td>
</tr>
<tr>
<td>7. Annie Laurie-McRee, Ph.D.</td>
<td>Assistant Professor, Division of Health Behavior &amp; Health Promotion, The Ohio State University</td>
<td><a href="mailto:almcree@cph.osu.edu">almcree@cph.osu.edu</a></td>
<td>HPV/HPV Vaccine</td>
</tr>
</tbody>
</table>
Appendix I

Expert Panel Packet & Instrument Evaluation Form (Reformatted to include 2 sheets per page)
Dear Panel Members:

Thank you for agreeing to assist me in the development of an instrument I conceptualized to assess theory of planned behavior-based constructs for predicting college students’ intentions to get the human papillomavirus (HPV) vaccine. Based on your expertise in one or more of the following areas: (1) college student populations, (2) HPV vaccination, (3) Theory of Planned Behavior, or (4) measurement and instrument development, I am requesting your assistance in establishing the readability, face validity, and content validity of this instrument.

College students have been selected as the priority population for this study. Eligibility of HPV vaccination is limited to 26 years of age. Eligibility to participate in this study will be limited to college students between 18 and 26 years of age. Individuals who have already taken any dose of the HPV vaccine are also not eligible to participate.

The instrument I have developed is comprised of four parts. The first part includes the questionnaire directions and screening questions. Section 1 contains 23 items designed to assess constructs of theory of planned behavior. These items were developed based on a qualitative elicitation study and pertinent literature. Section 2 contains a 19-item scale to measure HPV knowledge, which was adapted from a scale developed by Waller, Ostini, Marlow, McCaffery and Zimet (2013) in an article titled, “Validation of a measure of knowledge about human papillomavirus (HPV) using item response theory and classical test theory”. Additionally, two of these items (41 and 42) were developed based on findings from the qualitative elicitation study. Section 3 contains 19 items and will be used to collect descriptive and demographic information about the population. Several of the sexual behavior items in this section were modified from items in the National College Health Assessment II survey.

Please comment on the subscales and items in Sections 1 and 2 in regard to the following:

• **Readability**: Is the meaning of each item clear and at an appropriate reading level for college students?
• **Face validity**: Does each item appear to measure the intended construct as operationally defined?
• **Content validity**: Do the items in Sections 1 and 2 adequately assess each theory of planned behavior construct and HPV knowledge, respectively, within the universe of content as operationally defined?

Lastly, I would like you to provide general comments or other suggestions to improve the instrument on the last page of the evaluation form (see p. 20).

I am kindly requesting that you please review the instrument and provide your feedback by **October 6, 2014**. If you would prefer hardcopies of the instrument, please provide me with the appropriate postal address and I will be happy to mail the instrument and assessment form to you. If you have any questions, I can be reached at (XXX)-XXX-XXXX (cell phone) or via e-mail at hmpriest@crimson.ua.edu.

I am extremely grateful for your time and would like to convey my appreciation for your valuable comments on my instrument.

Sincerely,

Hannah M. Priest, CHES, MAED
**Part 1 Instructions:**

**Directions:**
Please answer the following questions to ensure you are eligible to participate in this study. Place an "X" on the appropriate circle.

<table>
<thead>
<tr>
<th>(1) Are the instructions readable?</th>
<th>(2) Comments on instructions:</th>
</tr>
</thead>
<tbody>
<tr>
<td>yes</td>
<td>no</td>
</tr>
</tbody>
</table>

**Screening/Exclusion Criteria:** Items 1, 2, and 3 are exclusion criteria. Item 1 seeks to exclude potential respondents who are younger than 18. Item 2 seeks to exclude potential participants who are older than 26 years of age. The HPV vaccine is not recommended for individuals over the age of 26. Item 3 seeks to exclude potential respondents who have already taken any doses of the HPV vaccine.

**Screening item 1:**
Are you under 18 years of age?
- Yes
- No

<table>
<thead>
<tr>
<th>(1) Is the item readable?</th>
<th>(2) Comments on the item:</th>
</tr>
</thead>
<tbody>
<tr>
<td>yes</td>
<td>no</td>
</tr>
</tbody>
</table>

**Screening item 2:**
Are you over 26 years of age?
- Yes
- No

<table>
<thead>
<tr>
<th>(1) Is the item readable?</th>
<th>(2) Comments on the item:</th>
</tr>
</thead>
<tbody>
<tr>
<td>yes</td>
<td>no</td>
</tr>
</tbody>
</table>

**Screening item 3:**
Have you received any doses of the human papilloma virus (HPV) vaccine, popularly known as Gardasil or Cervarix?
- Yes
- No

<table>
<thead>
<tr>
<th>(1) Is the item readable?</th>
<th>(2) Comments on the item:</th>
</tr>
</thead>
<tbody>
<tr>
<td>yes</td>
<td>no</td>
</tr>
</tbody>
</table>

Please continue to the next page...
**Section 1, Part A: Measuring behavioral intention to get all three doses of the HPV vaccine in the next 12 months**

**Universal Definition of Construct:** Behavioral intention is an indication of a person's readiness to perform a given behavior and is considered the immediate antecedent of behavior.

**Operational Definition of Construct:**
- The behavioral intention construct will be assessed in terms of the target, action, context, and time (TACT) principle.
- Behavioral intention to get all three doses of the HPV vaccine in the next 12 months is operationally defined as college students' (target) intention to get (action, as in 'get the HPV vaccine') all three doses (context) of the HPV vaccine within the next 12 months (time-frame).
- A total of 4 items will be used to assess this construct (items 1, 2, 3, 4).
- Measured with a 7-point Likert-type scale.
- Possible construct score range is 4 to 28.
- A higher score is indicative of greater intention to get all three doses of the HPV vaccine in the next 12 months.

**Section 2, Part A Instructions:** The questions in this section use rating scales with seven potential answers. Please indicate where you fall on the scale. For each question, please circle one number that is true for you. Please do not leave any questions blank.

<table>
<thead>
<tr>
<th>(1) Are the instructions readable?</th>
<th>(2) Comments on instructions:</th>
</tr>
</thead>
<tbody>
<tr>
<td>yes____</td>
<td>no___</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item 1: I intend to get all three doses of the HPV vaccine in the next 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Completely disagree:</strong> 1 : 2 : 3 : 4 : 5 : 6 : 7 : <strong>Completely agree</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(1) Is the item readable?</th>
<th>(2) Are the endpoints adequate?</th>
<th>(3) Is the item face valid?</th>
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</thead>
<tbody>
<tr>
<td>yes___</td>
<td>no___</td>
<td>yes___</td>
</tr>
</tbody>
</table>

**Comments on item or response endpoints:**

<table>
<thead>
<tr>
<th>Item 2: I will try to get all three doses of the HPV vaccine in the next 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Completely disagree:</strong> 1 : 2 : 3 : 4 : 5 : 6 : 7 : <strong>Completely agree</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(1) Is the item readable?</th>
<th>(2) Are the endpoints adequate?</th>
<th>(3) Is the item face valid?</th>
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</thead>
<tbody>
<tr>
<td>yes___</td>
<td>no___</td>
<td>yes___</td>
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</tbody>
</table>

**Comments on item or response endpoints:**

<table>
<thead>
<tr>
<th>Item 3: I plan to get all three doses of the HPV vaccine in the next 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Completely disagree:</strong> 1 : 2 : 3 : 4 : 5 : 6 : 7 : <strong>Completely agree</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(1) Is the item readable?</th>
<th>(2) Are the endpoints adequate?</th>
<th>(3) Is the item face valid?</th>
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<tbody>
<tr>
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<td>no___</td>
<td>yes___</td>
</tr>
</tbody>
</table>

**Comments on item or response endpoints:**

<table>
<thead>
<tr>
<th>Item 4: How likely is it that you will get all three doses of the HPV vaccine in the next 12 months?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Very unlikely:</strong> 1 : 2 : 3 : 4 : 5 : 6 : 7 : <strong>Very likely</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(1) Is the item readable?</th>
<th>(2) Are the endpoints adequate?</th>
<th>(3) Is the item face valid?</th>
</tr>
</thead>
<tbody>
<tr>
<td>yes___</td>
<td>no___</td>
<td>yes___</td>
</tr>
</tbody>
</table>

**Comments on item or response endpoints:**

<table>
<thead>
<tr>
<th>Item 5: Bad: 1 : 2 : 3 : 4 : 5 : 6 : 7 : Good</th>
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</thead>
<tbody>
<tr>
<td><strong>(1) Is the item readable?</strong></td>
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<td>-------------------------</td>
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<tr>
<td>yes___</td>
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**Comments on item or response endpoints:**

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<tr>
<td><strong>(1) Is the item readable?</strong></td>
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**Comments on item or response endpoints:**

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<tbody>
<tr>
<td><strong>(1) Is the item readable?</strong></td>
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<tr>
<td>-------------------------</td>
</tr>
<tr>
<td>yes___</td>
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</table>

**Comments on item or response endpoints:**

222
### Operational Definition of Construct:
Subjective norms are the perceived social pressures to perform or not perform a behavior.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Comments on item or response endpoints</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Unnecessary: 1:2:3:4:5:6:7; Necessary</td>
<td>(1) Is the item readable? (2) Are the endpoints adequate? (3) Is the item face valid?</td>
</tr>
<tr>
<td>9</td>
<td>Unhealthy: 1:2:3:4:5:6:7; Healthy</td>
<td>yes</td>
</tr>
<tr>
<td>10</td>
<td>Disadvantageous: 1:2:3:4:5:6:7; Advantageous</td>
<td>yes</td>
</tr>
<tr>
<td>11</td>
<td>Painful: 1:2:3:4:5:6:7; Painless</td>
<td>yes</td>
</tr>
<tr>
<td>12</td>
<td>Harmful: 1:2:3:4:5:6:7; Beneficial</td>
<td>yes</td>
</tr>
</tbody>
</table>

### Universal Definition of Construct:
Performed a Universal Definition of Construct:

### Subjective Norms to Get All Three Doses of the HPV Vaccine in the Next 12 Months

Most people who are important to me think that I should get all three doses of the HPV vaccine in the next 12 months.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Comments on item or response endpoints</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>Completely disagree: 1:2:3:4:5:6:7; Completely agree</td>
<td>(1) Is the item readable? (2) Are the endpoints adequate? (3) Is the item face valid?</td>
</tr>
<tr>
<td>14</td>
<td>Completely disagree: 1:2:3:4:5:6:7; Completely agree</td>
<td>yes</td>
</tr>
</tbody>
</table>

### Section 1, Part C: Measuring Subjective Norms To Get All Three Doses of the HPV Vaccine in the Next 12 Months (Items 13 to 16)

- A total of 4 items will be used to assess this construct (items 13, 14, 15, 16).
- Measured with a 7-point Likert-type scale.
- Possible construct score range is 4 to 28.
- A higher score is indicative of greater perceived social pressure to get all three doses of the HPV vaccine in the next 12 months.

- **Operational Definition of Construct:** Subjective norms are the perceived social pressures to perform or not perform a behavior.
- **Universal Definition of Construct:** Subjective norms are the perceived social pressures to perform or not perform a behavior.

**Operational Definition of Construct:**
Subjective norms are the perceived social pressures to perform or not perform a behavior.

**Universal Definition of Construct:** Subjective norms are the perceived social pressures to perform or not perform a behavior.

**Operational Definition of Construct:** Subjective norms are the perceived social pressures to perform or not perform a behavior.

**Universal Definition of Construct:** Subjective norms are the perceived social pressures to perform or not perform a behavior.

**Operational Definition of Construct:** Subjective norms are the perceived social pressures to perform or not perform a behavior.

**Universal Definition of Construct:** Subjective norms are the perceived social pressures to perform or not perform a behavior.
Operational Definition of Construct: perceptions of their ability to perform a given behavior.

Universal Definition of Construct: The perceived behavioral control construct refers to an individual's perceptions of their ability to perform a given behavior.

Operational Definition of Construct:
- For the purpose of this study, perceived behavioral control is operationally defined as the degree to which a person believes they are in control of getting all three doses of the HPV vaccine in the next 12 months
- Measured with a 7-point Likert-type self-reporting scale
- A total of 17 items will be used to assess this construct (Items 17, 18, 19, 20, 21, 22, 23)
- Measured with 7-point Likert-type self-reporting scales
- Possible construct score range is 7 to 49
- A higher score is indicative of greater perceived control over getting all three doses of the HPV vaccine in the next 12 months

Section 1, Part D: Measuring perceived behavioral control to get all three doses of the HPV vaccine in the next 12 months

Please continue to the next page...
**Section 2, Measuring HPV Knowledge**

**Universal Definition of Construct:** Knowledge is information and understanding acquired by an individual related to an action, idea, object, person, or situation.

**Operational Definition of Construct:**
- For the purpose of this study, HPV knowledge is an individual's understanding of HPV and HPV vaccination, including general prevalence, risk factors, transmission, prevention strategies, health risks, treatment, optimal time for vaccination, and vaccine efficacy.
- HPV knowledge will be assessed with 19 true/false/don't know items.
- HPV knowledge is derived from summing items 24 to 42.
- Items 26, 27, 28, 29, 30, 32, 34, 35, 36, 37, 40 are true; and 24, 25, 31, 33, 38, 39, 41, 42 are false.
- One point will be awarded for each correct answer. Don't know responses will be coded as incorrect.
- Possible construct score range is 0 to 19.
- A higher score is indicative of greater HPV knowledge.

---

<table>
<thead>
<tr>
<th>Item 21:</th>
<th>I am confident in my ability to get all three doses of HPV vaccine in the next 12 months, even if there is a financial cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Very unconfident:</strong> 1: 2: 3: 4: 5: 6: 7: <strong>Very confident</strong></td>
<td></td>
</tr>
<tr>
<td>(1) Is the item readable?</td>
<td>yes</td>
</tr>
<tr>
<td>(2) Are the endpoints adequate?</td>
<td>yes</td>
</tr>
<tr>
<td>(3) Is the item face valid?</td>
<td>yes</td>
</tr>
<tr>
<td>Comments on item or response endpoints:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item 22:</th>
<th>I am confident in my ability to get all three doses of HPV vaccine in the next 12 months, even if my schedule is busy.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Completely disagree:</strong> 1: 2: 3: 4: 5: 6: 7: <strong>Completely agree</strong></td>
<td></td>
</tr>
<tr>
<td>(1) Is the item readable?</td>
<td>yes</td>
</tr>
<tr>
<td>(2) Are the endpoints adequate?</td>
<td>yes</td>
</tr>
<tr>
<td>(3) Is the item face valid?</td>
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</tr>
<tr>
<td>Comments on item or response endpoints:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item 23:</th>
<th>I am able to get all three doses of HPV vaccine in the next 12 months.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Completely disagree:</strong> 1: 2: 3: 4: 5: 6: 7: <strong>Completely agree</strong></td>
<td></td>
</tr>
<tr>
<td>(1) Is the item readable?</td>
<td>yes</td>
</tr>
<tr>
<td>(2) Are the endpoints adequate?</td>
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</tr>
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<td>(3) Is the item face valid?</td>
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</tr>
<tr>
<td>Comments on item or response endpoints:</td>
<td></td>
</tr>
</tbody>
</table>

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**Section 2, Part A Instructions:** The following questions are true/false statements. Please place an “X” on the answer choice that you think is correct. Please do not guess. If you are unsure of the answer, please select “Don’t know”.

<table>
<thead>
<tr>
<th>Item 24:</th>
<th>HPV is very rare.</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ True</td>
<td>☐ False</td>
</tr>
</tbody>
</table>

| (1) Is the item readable? | yes | no |
| (2) Is the item face valid? | yes | no |
| Comments on item: | |

<table>
<thead>
<tr>
<th>Item 25:</th>
<th>HPV always has visible signs or symptoms.</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ True</td>
<td>☐ False</td>
</tr>
</tbody>
</table>

<p>| (1) Is the item readable? | yes | no |
| (2) Is the item face valid? | yes | no |
| Comments on item: | |</p>
<table>
<thead>
<tr>
<th>Item 26:</th>
<th>Item 30:</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPV can cause anal cancer.</td>
<td>HPV can cause genital warts.</td>
</tr>
<tr>
<td>✓ True</td>
<td>✓ True</td>
</tr>
<tr>
<td>✓ False</td>
<td>✓ False</td>
</tr>
<tr>
<td>✓ Don't know</td>
<td>✓ Don't know</td>
</tr>
</tbody>
</table>

(1) Is the item readable? | (2) Is the item face valid? |
| yes | no | yes | no |

Comments on item:

<table>
<thead>
<tr>
<th>Item 27:</th>
<th>Item 31:</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPV can be passed on by genital skin-to-skin contact.</td>
<td>Males cannot get HPV.</td>
</tr>
<tr>
<td>✓ True</td>
<td>✓ True</td>
</tr>
<tr>
<td>✓ False</td>
<td>✓ False</td>
</tr>
<tr>
<td>✓ Don't know</td>
<td>✓ Don't know</td>
</tr>
</tbody>
</table>

(1) Is the item readable? | (2) Is the item face valid? |
| yes | no | yes | no |

Comments on item:

<table>
<thead>
<tr>
<th>Item 28:</th>
<th>Item 32:</th>
</tr>
</thead>
<tbody>
<tr>
<td>There are many types of HPV.</td>
<td>Using condoms reduces the risk of getting HPV.</td>
</tr>
<tr>
<td>✓ True</td>
<td>✓ True</td>
</tr>
<tr>
<td>✓ False</td>
<td>✓ False</td>
</tr>
<tr>
<td>✓ Don't know</td>
<td>✓ Don't know</td>
</tr>
</tbody>
</table>

(1) Is the item readable? | (2) Is the item face valid? |
| yes | no | yes | no |

Comments on item:

<table>
<thead>
<tr>
<th>Item 29:</th>
<th>Item 33:</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPV can be passed on during sexual intercourse.</td>
<td>HPV can be cured with antibiotics.</td>
</tr>
<tr>
<td>✓ True</td>
<td>✓ True</td>
</tr>
<tr>
<td>✓ False</td>
<td>✓ False</td>
</tr>
<tr>
<td>✓ Don't know</td>
<td>✓ Don't know</td>
</tr>
</tbody>
</table>

(1) Is the item readable? | (2) Is the item face valid? |
| yes | no | yes | no |

Comments on item:
<table>
<thead>
<tr>
<th>Item 34:</th>
<th>Item 38:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Having many sexual partners increases the risk of getting HPV.</td>
<td>The HPV vaccine offers protection against all sexually transmitted infections.</td>
</tr>
<tr>
<td>✓ True</td>
<td>✓ True</td>
</tr>
<tr>
<td>✓ False</td>
<td>✓ False</td>
</tr>
<tr>
<td>✓ Don’t know</td>
<td>✓ Don’t know</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item 35:</th>
<th>Item 39:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most sexually active people will get HPV at some point in their lives.</td>
<td>Someone who has had HPV vaccine cannot develop anal cancer.</td>
</tr>
<tr>
<td>✓ True</td>
<td>✓ True</td>
</tr>
<tr>
<td>✓ False</td>
<td>✓ False</td>
</tr>
<tr>
<td>✓ Don’t know</td>
<td>✓ Don’t know</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item 36:</th>
<th>Item 40:</th>
</tr>
</thead>
<tbody>
<tr>
<td>A person could have HPV for many years without knowing it.</td>
<td>The HPV vaccine is most effective if given to people who have never had sex.</td>
</tr>
<tr>
<td>✓ True</td>
<td>✓ True</td>
</tr>
<tr>
<td>✓ False</td>
<td>✓ False</td>
</tr>
<tr>
<td>✓ Don’t know</td>
<td>✓ Don’t know</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item 37:</th>
<th>Item 41:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Having sex at an early age increases the risk of getting HPV.</td>
<td>Someone who has had HPV vaccine is at higher risk for contracting HPV.</td>
</tr>
<tr>
<td>✓ True</td>
<td>✓ True</td>
</tr>
<tr>
<td>✓ False</td>
<td>✓ False</td>
</tr>
<tr>
<td>✓ Don’t know</td>
<td>✓ Don’t know</td>
</tr>
</tbody>
</table>
Item 42:
The HPV vaccine is used to cure individuals who have HPV.
- True
- False
- Don’t know

(1) Is the item readable? [yes]  (2) Is the item face valid? [yes]

Comments on item:

Section 3: Descriptive and Demographic Questions

Instructions: For this last section, please place an "X" next to the appropriate response. All responses will be kept confidential and private. Only group data will be reported.

(1) Are the instructions readable? [yes]  (2) Comments on the instructions:

Item 43:
What is your biological sex?
- Female
- Male

(1) Is the item readable? [yes]  (2) Comments on the item:

Item 44:
Before you were invited to participate in this study, had you heard about human papillomavirus (HPV)?
- Yes
- No

(1) Is the item readable? [yes]  (2) Comments on the item:

Item 45:
Before you were invited to participate in this study, had you heard about the vaccine for human papillomavirus (HPV), also known as Gardasil or Cervarix?
- Yes
- No

(1) Is the item readable? [yes]  (2) Comments on item:

Item 46:
What is your age?
- 18
- 19
- 20
- 21
- 22
- 23
- 24
- 25
- 26

(1) Is the item readable? [yes]  (2) Comments on the item:

Item 47:
What is your relationship status?
- Not in a relationship
- In a relationship but not living together
- In a relationship and living together

(1) Is the item readable? [yes]  (2) Comments on the item:

Item 48:
What is your marital status?
- Single, never married
- Married
- Separated
- Divorced
- Widower

(1) Is the item readable? [yes]  (2) Comments on the item:
<table>
<thead>
<tr>
<th>Item 49:</th>
<th>Item 53:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you consider yourself:</td>
<td>Within the last 12 months, with how many partners have you had anal sex? If you did not engage in anal sex within the last 12 months, please write &quot;0&quot; in the box below.</td>
</tr>
<tr>
<td>☑ Heterosexual or straight</td>
<td>(1) Is the item readable? (2) Comments on the item:</td>
</tr>
<tr>
<td>☑ Gay or lesbian</td>
<td>yes___ no___</td>
</tr>
<tr>
<td>☑ Bisexual</td>
<td>(1) Is the item readable? (2) Comments on the item:</td>
</tr>
<tr>
<td>☑ Asexual</td>
<td>yes___ no___</td>
</tr>
<tr>
<td>☑ Other: ______ (please write)</td>
<td>yes___ no___</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item 50:</th>
<th>Item 54:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you ever had oral, anal, or vaginal sex?</td>
<td>Within the last 12 months, with how many partners have you had vaginal sex? If you did not engage in vaginal sex within the last 12 months, please write &quot;0&quot; in the box below.</td>
</tr>
<tr>
<td>☑ Yes</td>
<td>(1) Is the item readable? (2) Comments on the item:</td>
</tr>
<tr>
<td>☑ No</td>
<td>yes___ no___</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item 51:</th>
<th>Item 55:</th>
</tr>
</thead>
<tbody>
<tr>
<td>During your lifetime, with how many partners have you had oral, anal, or vaginal sex? If you have never engaged in oral, anal, or vaginal sex please write &quot;0&quot; in the box below.</td>
<td>Within the last 30 days, did you have oral sex?</td>
</tr>
<tr>
<td>(1) Is the item readable? (2) Comments on the item:</td>
<td>☑ Yes</td>
</tr>
<tr>
<td>yes___ no___</td>
<td>☑ No, have never done this sexual activity</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item 52:</th>
<th>Item 56:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within the last 12 months, with how many partners have you had oral sex? If you did not engage in oral sex within the last 12 months, please write &quot;0&quot; in the box below.</td>
<td>Within the last 30 days, did you have anal sex?</td>
</tr>
<tr>
<td>(1) Is the item readable? (2) Comments on the item:</td>
<td>☑ Yes</td>
</tr>
<tr>
<td>yes___ no___</td>
<td>☑ No, have never done this sexual activity</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item 53:</th>
<th>Item 54:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within the last 12 months, with how many partners have you had anal sex? If you did not engage in anal sex within the last 12 months, please write &quot;0&quot; in the box below.</td>
<td>Within the last 12 months, with how many partners have you had vaginal sex? If you did not engage in vaginal sex within the last 12 months, please write &quot;0&quot; in the box below.</td>
</tr>
<tr>
<td>(1) Is the item readable? (2) Comments on the item:</td>
<td>yes___ no___</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item 55:</th>
<th>Item 56:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within the last 30 days, did you have oral sex?</td>
<td>Within the last 30 days, did you have anal sex?</td>
</tr>
<tr>
<td>☑ Yes</td>
<td>☑ Yes</td>
</tr>
<tr>
<td>☑ No, have never done this sexual activity</td>
<td>☑ No, have never done this sexual activity</td>
</tr>
<tr>
<td>☑ No, have done this activity in the past but not in the past 30 days</td>
<td>☑ No, have done this activity in the past but not in the past 30 days</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item 54:</th>
<th>Item 56:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within the last 12 months, with how many partners have you had vaginal sex? If you did not engage in vaginal sex within the last 12 months, please write &quot;0&quot; in the box below.</td>
<td>Within the last 30 days, did you have anal sex?</td>
</tr>
<tr>
<td>(1) Is the item readable? (2) Comments on the item:</td>
<td>yes___ no___</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item 55:</th>
<th>Item 56:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within the last 30 days, did you have oral sex?</td>
<td>Within the last 30 days, did you have anal sex?</td>
</tr>
<tr>
<td>☑ Yes</td>
<td>☑ Yes</td>
</tr>
<tr>
<td>☑ No, have never done this sexual activity</td>
<td>☑ No, have never done this sexual activity</td>
</tr>
<tr>
<td>☑ No, have done this activity in the past but not in the past 30 days</td>
<td>☑ No, have done this activity in the past but not in the past 30 days</td>
</tr>
</tbody>
</table>
**Item 57:** Within the last 30 days, did you have vaginal sex?
- Yes
- No, have never done this sexual activity
- No, have done this activity in the past but not in the past 30 days

**Item 58:** Are you of Hispanic, Latino, or Spanish origin?
- Yes
- No

**Item 59:** Which race best describes you? Select all that apply.
- African American
- Asian
- Caucasian
- American Indian/Alaska Native
- Native Hawaiian/Pacific Islander
- More than one race
- Other: __________________ (Please write)

**Item 60:** What is your year in school?
- 1st year undergraduate
- 2nd year undergraduate
- 3rd year undergraduate
- 4th year undergraduate
- 5th year or more undergraduate
- Graduate
- Other: ____________ (please write)

**Item 61:** What is your primary source of health insurance?
- My parents'/guardians' plan
- My college/university sponsored plan
- Another plan: ____________ (please write)
- I don't have health insurance
- I am not sure if I have health insurance

Please provide any additional feedback in the space below. I would appreciate any suggestions you have to improve the questionnaire.

Thank you very much for your time!
Appendix J

Electronic Version of Instrument (Information Sheet for Research is Embedded)

Screen 1

THE UNIVERSITY OF ALABAMA

HPV Vaccination Opinions Study Invitation

Dear Student:

Human papillomavirus (HPV) is an important health issue. In this study, I hope to find out college students' opinions about HPV vaccination. I am requesting that you share your opinions about this pertinent issue by completing an online questionnaire. The questionnaire will also ask some questions about your sexual behavior and demographics.

Please note that to participate in this study you must be:

- A student at The University of Alabama
- Between 18 and 26 years of age
- Who has not taken any doses (shots) of the HPV vaccine.

If you are interested in participating in this study OR the alternative activity, please select "yes" below and then press continue (bottom, right corner of your screen). You will be asked three screening questions that will help ensure you meet this study's participation criteria. If you qualify for the study but do not wish to participate in it, you will be given the option to complete the alternative activity.

If you qualify for the study and indicate your willingness to participate, you will be asked to read the Information Research Sheet, which will explain your rights as a research participant.

The HPV vaccination questionnaire and alternative activity both take about 20 minutes to complete. Completion of the online questionnaire or alternative activity qualifies you to receive up to five bonus points for your participation. If you wish to receive bonus points, you must provide your first and last name, your instructor's name, course prefix, and course section on the last page of the questionnaire/alternative activity. Please note that each question must be answered in order to receive bonus points.

Thank you in advance for your assistance with this important research!

☐ YES, I am interested in participating in this study OR the alternative activity.
☐ NO, I am not interested in participating in this study OR the alternative activity.

Screen 2

Are you under 18 years of age?

☐ Yes
☐ No

Screen 3

Are you over 26 years of age?

☐ Yes
☐ No
**Screen 4**

Have you received any doses (shots) of the human papillomavirus (HPV) vaccine?
- Yes
- No
- Don’t know

**Screen 5**

**Congratulations!** You are eligible to participate in this study.

Please indicate which option you would like to proceed with:
- The University of Alabama Human Papillomavirus (HPV) Questionnaire
- Alternative Activity

**Screen 6**

**THE UNIVERSITY OF ALABAMA**

**Introduction:** You are being asked to take part in a research study. Please read this page carefully and ask questions about anything that you do not understand. This study is called Validation of a Theory of Planned Behavior-based Instrument to Predict Human Papillomavirus (HPV) Vaccination Intentions of College Students. Hannah Priest, a graduate student at the University of Alabama, is conducting the study.

**Is the researcher being paid for this study?**
The researcher is receiving no funding for this study.

**Is this research development a product that will be sold, and if so, will the investigator profit from it?**
No, this research is not developing a product that will be sold.

**Does the investigator have any conflict of interest in this study?**
The researcher has no conflict of interest to disclose.

**What is this study about? What is the investigator trying to learn?**
The purpose of this research study is: (1) to determine college students' opinions about getting the HPV vaccine, and (2) develop a theoretical framework to predict HPV vaccination intentions of college students.

**Why is this study important or useful?**
This knowledge is important because personal opinions about the HPV vaccine can influence vaccination intentions and uptake. The results may help health education researchers develop more effective interventions to increase HPV vaccination intentions in college students.

**What will I be asked to do in this study?**
If you meet the criteria and agree to be in this study, you will be asked to complete a 41-item questionnaire online via Qualtrics. The questionnaire includes items regarding your opinions about HPV vaccination. Additionally, you will be asked a few questions about your sexual behavior and demographics.

**Why have I been asked to be in this study?**
You have been asked to be in this study because HPV is an important health issue for college students.

**To be in this study you must be:**
1. A student at The University of Alabama
2. Between 18 and 25 years of age
3. Who has not received any doses of the HPV vaccine

**How many people will be in this study?**
Approximately 600 (300 males and 300 females) will participate in this phase of the study.
How much time will I spend being in this study? The 41-item questionnaire will take approximately 20 minutes to complete. The entire study will take approximately 25 minutes of your time.

Will being in this study cost me anything? The only cost to you from this study is your time.

Will I be compensated for being in this study? You will not be compensated for participating in this research study.

What are the risks (dangers or harms) to me if I am in this study? There are no physical risks or discomforts in this study. The psychological risks or discomforts due to participating in this study are minimal. Should you experience such discomfort, we will inform you about counseling services offered by the University of Alabama Counseling Center (205-348-3863).

What are the benefits (good things) that may happen if I am in this study? You may receive up to 5 points in extra credit towards the course in which you were recruited to complete the questionnaire. Participation in this study may increase your awareness of and knowledge about the HPV vaccine.

What are the benefits to science or society? Findings from this study may be used to help design health education and promotion programs to increase HPV vaccine uptake in college students. As a result, society could benefit from a lower prevalence of HPV infection and associated diseases.

How will my privacy be protected? You do not have to answer any question that you do not want to. You do not have to participate in this study if you do not want to. The online questionnaire can be completed through the Internet in the privacy of your own home or at another location of your choosing.

How will my confidentiality be protected? To receive extra credit for completion of the questionnaire, you must type your first and last name, along with your instructor’s name, course title, and section number into boxes on the last page. However, your name will remain confidential. Your name will only be collected to ensure that you receive the incentive (bonus points). The results of the study may be presented or published for scientific purposes; however, the information you provide cannot be linked to you. Please note you do not have to accept the extra credit to participate in this study, in which case you do not have to provide your name.

What are the alternatives to being in this study? Do I have other choices? You have two alternatives to being in this study. The first is not to participate. The second is to complete a designated alternative activity. The alternative activity entails reading a handout on hookah use, and responding to 16 multiple-choice, true/false, and fill-in the blank questions. If you wish to complete the alternative assignment, please proceed through the screening questions until you are automatically redirected to the activity, or you see the question, “Which option do you want to proceed with?” Select the “Alternative Activity” option and you will be re-directed to the activity.

What are my rights as a participant in this study? Taking part in this study is voluntary. It is your free choice. You can refuse to participate in this study. You may start and then change your mind and stop at any time. There will be no effect on your relations with the University of Alabama.

The University of Alabama Institutional Review Board (“the IRB”) is the committee that protects the rights of people in research studies. The IRB may review study records from time to time to be sure that people in research studies are being treated fairly and that the study is being carried out as planned.

Who do I call if I have questions or problems? If you have questions, concerns, or complaints about the study right now, please ask them. If you have questions, concerns, or complaints about the study later on, please call Hannah Priest at (205) 348-1625.

If you have questions about your rights as a person in a research study, call Ms. Tanya Myles, the Research Compliance Officer of the University, at 205-348-8461 or toll-free at 1-877-820-3066.

You may also ask questions, make suggestions, or file complaints and concerns through the IRB Outreach website at http://osp.ua.edu/site/PRCO_Welcome.html or email the Research Compliance office at participantoutreach@bama.ua.edu.

Before you participate, you are encouraged to complete the survey for research participants that is online at the outreach website or you may ask the investigator for a copy of it and mail it to the University Office for Research Compliance, Box 870127, 358 Rose Administration Building, Tuscaloosa, AL 35487-0127.

"BY SELECTING YES BELOW AND COMPLETING THE QUESTIONNAIRE, YOU INDICATE CONSENT FOR YOUR ANSWERS TO BE USED IN THIS RESEARCH STUDY. PLEASE PRINT THIS INFORMATION SHEET FOR YOUR RECORDS"

○ YES, my confidential responses may be used for research purposes as described above.

○ NO, my confidential responses may not be used for research purposes as described above.
Prior to beginning the survey, please read the information provided in the box below about human papillomavirus (HPV) and the HPV vaccine.

- Human papillomavirus (HPV) is a sexually transmitted infection.
- HPV vaccination involves getting three shots.
- All three shots are given within a 12-month period.

The questions in this section use rating scales with seven potential responses. Please indicate where you fall on the scale. For each item, please select one number, which most closely matches your opinion.

I intend to get all three doses of the HPV vaccine in the next 12 months

1 2 3 4 5 6 7
Completely disagree | | | | | | | Complete agree

I will try to get all three doses of the HPV vaccine in the next 12 months

1 2 3 4 5 6 7
Completely disagree | | | | | | | Complete agree
Screen 11

I plan to get all three doses of the HPV vaccine in the next 12 months

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<th>2</th>
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<th>6</th>
<th>7</th>
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</thead>
<tbody>
<tr>
<td><strong>Completely disagree</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Completely agree</strong></td>
<td></td>
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Screen 12

I think getting all three doses of the HPV vaccine in the next 12 months would be

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<tbody>
<tr>
<td><strong>Very bad</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Not at all protective</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Unnecessary</strong></td>
<td></td>
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<tr>
<td><strong>Very unhealthy</strong></td>
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<tr>
<td><strong>Disadvantageous</strong></td>
<td></td>
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<tr>
<td><strong>Extremely painful</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Extremely harmful</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Very good</strong></td>
<td></td>
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<tr>
<td><strong>Extremely protective</strong></td>
<td></td>
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<tr>
<td><strong>Necessary</strong></td>
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<tr>
<td><strong>Very healthy</strong></td>
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<tr>
<td><strong>Advantageous</strong></td>
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<tr>
<td><strong>Painless</strong></td>
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<tr>
<td><strong>Extremely beneficial</strong></td>
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Screen 13

Most people who are important to me think that I should get all three doses of the HPV vaccine in the next 12 months

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<tbody>
<tr>
<td><strong>Completely disagree</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Completely agree</strong></td>
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My parent(s) or legal guardian(s) would like me to get all three doses of the HPV vaccine in the next 12 months

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<th>7</th>
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<tbody>
<tr>
<td><strong>Completely disagree</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Completely agree</strong></td>
<td></td>
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Family members other than my parent(s) or legal guardian(s) (for example, siblings, aunts, uncles, grandparents, etc.) would like me to get all three doses of the HPV vaccine in the next 12 months

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<tbody>
<tr>
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<td></td>
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<tr>
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</table>

My friends would like me to get all three doses of the HPV vaccine in the next 12 months

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<tr>
<td><strong>Completely disagree</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Completely agree</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

235
If I wanted to, I am sure I could get all three doses of the HPV vaccine in the next 12 months

1 2 3 4 5 6 7

Completely unsure | ♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦ Complete sure

For me to get all three doses of the HPV vaccine in the next 12 months would be

1 2 3 4 5 6 7

Extremely difficult ♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦ Extremely easy

How much control do you have to get all three doses of the HPV vaccine in the next 12 months

1 2 3 4 5 6 7

No control ♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦ Complete control

Screen 15

I am confident I can get all three doses of the HPV vaccine in the next 12 months, even if there is a financial cost

1 2 3 4 5 6 7

Very unconfident ♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦ Very confident

I am confident I can get all three doses of the HPV vaccine in the next 12 months, even if my schedule is busy

1 2 3 4 5 6 7

Very unconfident ♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦ Very confident

I am confident I can find a healthcare provider (for example, clinic, health center, physician’s office) where I can get all three doses of the HPV vaccine in the next 12 months

1 2 3 4 5 6 7

Very unconfident ♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦ Very confident
For this section, please select the appropriate response. All responses will be kept confidential and private. Only group data will be reported.

Before you were invited to participate in this study, had you heard about human papillomavirus (HPV)?
- Yes
- No

Before you were invited to participate in this study, had you heard about the vaccine for human papillomavirus (HPV)?
- Yes
- No

What is your biological sex?
- Female
- Male

What is your age?
- 18
- 19
- 20
- 21
- 22
- 23
- 24
- 25
- 26

Do you consider yourself:
- Heterosexual or straight
- Gay or lesbian
- Bisexual
- Asexual
- Other (please write):

What is your relationship status?
- Not in a relationship
- In a relationship but not living together
- In a relationship and living together

What is your marital status?
- Single, never married
- Married
- Separated
- Divorced
- Widower
Screen 18

In the next few questions, sex is defined as the following acts done by you or to you.

- **Oral sex** means mouth on a penis, vagina, or anus (butt)
- **Vaginal sex** means penis in vagina
- **Anal sex** means penis in anus (butt)

Have you ever engaged in any of the following sexual activities: oral sex, vaginal sex, and/or anal sex?

- Yes
- No

Screen 19

During your **lifetime**, with how many people have you had **oral** sex? Please type the total amount as a number in the box below. If you have never had oral sex please type "0" in the box.

During your **lifetime**, with how many people have you had **vaginal** sex? Please type the total amount as a number in the box below. If you have never had vaginal sex please type "0" in the box.

During your **lifetime**, with how many people have you had **anal** sex? Please type the total amount as a number in the box below. If you have never had anal sex please type "0" in the box.

Screen 20

Within the **last 12 months**, with how many people have you had **oral** sex? Please type the total amount as a number in the box below. If you did not have oral sex within the last 12 months, please type "0" in the box below.

Within the **last 12 months**, with how many people have you had **vaginal** sex? Please type the total amount as a number in the box below. If you did not have vaginal sex within the last 12 months, please type "0" in the box below.

Within the **last 12 months**, with how many people have you had **anal** sex? Please type the total amount as a number in the box below. If you did not have anal sex within the last 12 months, please type "0" in the box below.
### Screen 21

**Within the last 30 days, did you have oral sex?**
- Yes
- No, have never engaged in this sexual activity
- No, have done this activity in the past, but not in the past 30 days

**Within the last 30 days, did you have vaginal sex?**
- Yes
- No, have never engaged in this sexual activity
- No, have done this activity in the past, but not in the past 30 days

**Within the last 30 days, did you have anal sex?**
- Yes
- No, have never engaged in this sexual activity
- No, have done this activity in the past, but not in the past 30 days

### Screen 22

**Are you of Hispanic, Latino/a, or Spanish origin?**
- Yes
- No

**Which race best describes you? Select all that apply.**
- African American/Black
- Asian
- Caucasian/White
- American Indian/Americas Native
- Native Hawaiian/Pacific Islander
- More than one race
- Other (Please write)

**What is your year in school?**
- 1st year undergraduate
- 2nd year undergraduate
- 3rd year undergraduate
- 4th year undergraduate
- 5th year or more undergraduate
- Graduate
- Other (Please write)

**What is your primary source of health insurance?**
- My college/university sponsored plan
- My parents/guardians' plan
- Another plan (please write)
- I don't have health insurance
- I am not sure if I have health insurance
Extra Credit Sheet

To receive bonus points for your participation, please provide the following information below. This information will be separated from your responses by the principal investigator as soon as the data is downloaded. Thus, there will be no way to link your questionnaire responses to you.

If you do not wish to receive extra credit please proceed with the survey by clicking the arrow at the bottom of the page.

Your First and Last Name

Instructor's First and Last Name

Course (i.e., HHE 270)

Section (i.e., 001)

We thank you for your time spent taking this survey. Your response has been recorded.
Appendix K

Copy of Letter of Approval from University of Alabama Institutional Review Board to Conduct Pilot, Test-Retest, and Main Quantitative Study (Reformatted to Fit on the Page)
December 2, 2014

Hannah Priest
Department of Health Sciences
CHES
Box 870311

Re: IRB#: 14-OR-411 “Validation of a Theory of Planned Behavior-based Instrument to Predict Human Papillomavirus (HPV) Vaccination Intentions of College Students”

Dear Ms. Priest:

The University of Alabama Institutional Review Board has granted approval for your proposed research.

Your application has been given expedited approval according to 45 CFR part 46. You have also been granted the requested waivers. Approval has been given under expedited review category 7 as outlined below:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Your application will expire on December 1, 2015. If your research will continue beyond this date, complete the relevant portions of the IRB Renewal Application. If you wish to modify the application, complete the Modification of an Approved Protocol Form. Changes in this study cannot be initiated without IRB approval, except when necessary to eliminate apparent immediate hazards to participants. When the study closes, complete the appropriate portions of the IRB Request for Study Closure Form.

Please use reproductions of the IRB approved stamped information sheets to obtain consent from your participants.

Should you need to submit any further correspondence regarding this proposal, please include the above application number.

Good luck with your research.

Sincerely,

Chair, Institutional Review Board
Appendix L

Information Sheet for Research for Pilot and Test-Retest Instrument Administrations
To be in this study you must be:
(1) A student at The University of Alabama
(2) Between 18 and 26 years of age
(3) Who has not received any doses (shots) of the HPV vaccine

How many people will be in this study?
Approximately 20 (~10 college males, 10 college females) will participate in phase 1 of this study.
Approximately 120 (~60 college males, 60 college females) will participate in phase 2 of this study.
Approximately 600 (~300 males, 300 females) will participate in phase 3 of this study.
About 640 college males and females total will participate in this study.

How much time will I spend being in this study?
• If you are involved with phase 1, you will be asked to complete a 45-item questionnaire one time, which is expected to take approximately 25 minutes to complete. The entire study will take approximately 30 minutes of your time.
• If you are involved in phase 2, you will be asked to complete the 41-item questionnaire twice, on two separate occasions. The questionnaire is expected to take approximately 20 minutes to complete. The entire study will take approximately 45 minutes of your time.
• If you are involved with phase 3, you will be asked to complete a 41-item survey one time, which is expected to take approximately 20 minutes to complete. The entire study will take approximately 25 minutes of your time.

Will being in this study cost me anything? The only cost to you from this study is your time.

Will I be compensated for being in this study? You will not be compensated for participating in this research study.

What are the risks (dangers or harms) to me if I am in this study?
There are no physical risks or discomforts in this study. The psychological risks or discomforts due to participating in this study are minimal. Should you experience such discomfort, we will inform you about counseling services offered by the University of Alabama Counseling Center (205-348-3863).

What are the benefits (good things) that may happen if I am in this study?
You may receive up to 5 points in extra credit towards the course in which you were recruited to complete the questionnaire. Participation in this study may increase your awareness of and knowledge about the HPV vaccine.

What are the benefits to science or society?
Findings from this study may be used to help design health education and promotion programs to increase HPV vaccine uptake in college students. As a result, society could benefit from a lower prevalence of HPV infection and associated diseases.

How will my privacy be protected?
You do not have to answer any question that you do not want to. If you feel uncomfortable completing the survey during class time, you can take it in the private office of Ms. Priest. Please alert the researcher if you would like this option.
How will my confidentiality be protected?
To receive extra credit for completion of the questionnaire, you must print your first and last name, along with your instructor’s name, course title, and section number on the last page of the study packet. However, your name will remain confidential. Your name will only be collected to ensure that you receive the incentive (bonus points). The results of the study may be presented or published for scientific purposes; however, the information you provide cannot be linked to you. Please note you do not have to accept the extra credit to participate in this study, in which case you do not have to provide your name.

What are the alternatives to being in this study? Do I have other choices?
You have two alternatives to being in this study. The first is not to participate. The second is to complete a designated alternative assignment. The alternative assignment entails reviewing an article on hookah, and responding to 16 multiple choice, true/false, and fill in the blank items. If you wish to complete the alternative assignment, please inform the principal investigator.

What are my rights as a participant in this study?
Taking part in this study is voluntary. It is your free choice. You can refuse to participate in this study. You may start and then change your mind and stop at any time. There will be no effect on your relations with the University of Alabama.

The University of Alabama Institutional Review Board (“the IRB”) is the committee that protects the rights of people in research studies. The IRB may review study records from time to time to be sure that people in research studies are being treated fairly and that the study is being carried out as planned.

Who do I call if I have questions or problems?
If you have questions, concerns, or complaints about the study right now, please ask them. If you have questions, concerns, or complaints about the study later on, please call Hannah Priest at (XXX) XXX-XXXX.

If you have questions about your rights as a person in a research study, call Ms. Tanta Myles, the Research Compliance Officer of the University, at 205-348-8461 or toll-free at 1-877-820-3066.

You may also ask questions, make suggestions, or file complaints and concerns through the IRB Outreach website at http://osp.ua.edu/site/PRCO_Welcome.html or email the Research Compliance office at participantoutreach@bama.ua.edu.

After you participate, you are encouraged to complete the survey for research participants that is online at the outreach website or you may ask the investigator for a copy of it and mail it to the University Office for Research Compliance, Box 870127, 358 Rose Administration Building, Tuscaloosa, AL 35487-0127.

"BY COMPLETING THE SURVEY, YOU INDICATE CONSENT FOR YOUR ANSWERS TO BE USED IN THIS RESEARCH STUDY."

PLEASE KEEP THIS INFORMATION SHEET FOR YOUR RECORDS.
Appendix M

Alternative Activity Questions for Pilot and Test Portion of Test-Retest Administration
(*Note: Only two pages of activity provided to conserve space)
Alternative Activity

Hookah Use

Instructions: After reading the following passage, please respond to the questions on pages 4-6. If you would like to receive bonus points, please be sure to complete the Extra Credit Sheet on page 7.

Alternative Activity Questions

Name: ________________

1. ____________ Which of the following is not another name for hookah?
   a. Nargile
   b. Shisha
   c. Sheesah
   d. Shisha
   e. Arghile

2. ____________ True or False: Hookah is typically smoked in groups, with a different mouthpiece for each person.

3. The charcoal used to heat the tobacco can raise health risks by producing high levels of ____________ metals, and ____________ causing chemicals.

4. ____________ True or False: Hookah use among college-age students is declining.

5. ____________ True or False: Secondhand smoke from hookahs can be a health risk for nonsmokers.

6. ____________ Which of the following is not a health risk faced by hookah smokers?
   a. Oral cancer
   b. Decreased fertility
   c. Lung cancer
   d. Pancreatic cancer
   e. Stomach cancer

7. ____________ may be passed to other smokers by sharing a hookah.

8. ____________ True or False: The smoke from hookah tobacco is at least as toxic as cigarette smoke.

9. ____________ True or False: Due to the way hookah is used, hookah smokers may absorb less of the toxic substances also found in cigarette smoke than cigarette smokers do.

10. Hookah tobacco delivers ____________ the same highly addictive drug found in other tobacco products.

11. Babies born to women who smoked water pipes every day while pregnant weigh ____________ at birth (at least ______ ounces less) than babies born to nonsmokers.

12. Where did hookah use originate? ____________ _______ and ____________

13. ____________ Which countries are hookah cafes gaining popularity around the world?
   a. France
   b. Russia
   c. United States
   d. All of the above
   e. Answer choices b and c only

14. ____________ According to a 2010 survey, what percent of high school seniors used hookah in the past year?
   a. 17% (boys), 15% (girls)
   b. 15% (boys), 17% (girls)
   c. 24% (boys), 12% (girls)
   d. 12% (boys), 24% (girls)
   e. 17% (boys), 15% (girls)

15. How does an hour-long session of hookah smoking compare to smoking a cigarette?
   a. An hour-long hookah smoking session involves 100 puffs, while smoking an average cigarette involves 200 puffs
   b. An hour-long hookah smoking session involves 50 puffs, while smoking an average cigarette involves 100 puffs
   c. An hour-long hookah smoking session involves 100 puffs, while smoking an average cigarette involves 200 puffs
   d. An hour-long hookah smoking session involves 200 puffs, while smoking an average cigarette involves 200 puffs
   e. An hour-long hookah smoking session involves 100 puffs, while smoking an average cigarette involves 200 puffs

16. Why did you choose to complete the alternative activity instead of the survey for the main study? Please select all that apply.
   a. I am under 18 years of age
   b. I am over 26 years of age
   c. I have taken at least one dose of the HPV vaccine
   d. I was not interested in the main study
   e. I was not comfortable with the main study’s topic
   f. Other: ____________ (please write)

Thank you! Please proceed to the next page if you wish to receive extra credit points for completion of this activity.
Appendix N

Alternative Activity Questions for Retest Portion of Test-Retest Administration
(*Note: Only two pages of activity provided to conserve space)
Alternative Activity – Part 2

Opportunities for Policy Interventions to Reduce Youth Hookah Smoking in the United States

Name: ________________________________

Instructions: After reading the attached article, please respond to the questions below.

1. _____ All of the following are examples of potential policy interventions to reduce hookah use except:
   a) Enacting smoke-free air laws and removing exemptions for hookah lounges
   b) Requiring warning labels on hookah tobacco
   c) Expanding shipping restrictions on tobacco products
   d) Limiting the number of hookah lounges within city limits to five or less
   e) Equalizing tobacco tax rates for all tobacco types

2. Most tobacco users become addicted during ________________.

3. _____ Which of the following is not a predictor of smoking hookah?
   a) Smoking marijuana
   b) Perceiving that smoking a hookah is not harmful
   c) Social acceptability
   d) Having friends and family members who smoke

4. _____ What is the single most powerful intervention to reduce youth smoking? __________________________

5. _____ True or False: Although fewer children and adolescents are smoking cigarettes, an increasing number are smoking tobacco using a hookah.

6. _____ How does the federal tax on pipe tobacco compare to cigarette tobacco?
   a) The tax on pipe tobacco is nearly $22 per pound more than the tax on cigarette tobacco
   b) The tax on pipe tobacco is nearly $7.08 per pound more than the tax on cigarette tobacco
   c) The tax on pipe tobacco is nearly $22 per pound less than the tax on cigarette tobacco
   d) The tax on pipe tobacco is nearly $7.08 per pound less than the tax on cigarette tobacco

7. The 2009 _________________ Act banned flavored cigarettes with the exception of ____________. However, the flavor ban does not extend to ____________.

8. _____ True or False: Hookah carries less risk of tobacco-related disease than cigarette smoking.

9. In 2011, ______ percent of 12th-grade students reported having smoked a hookah in the past year.

10. For every ___% increase in the real price of cigarettes, the number of youth who smoke drops by ___% to ___%.

11. _____ True or False: Federal law requires warning labels on cigarettes, smokeless tobacco, and pipe tobacco.

12. _____ True or False: The Prevent All Cigarette Trafficking Act stops the US Postal Service from shipping shisha or other pipe tobacco.

13. _____ Hookah lounge websites most commonly focus on all of the following except:
   a) Product quality
   b) Pleasure
   c) Flavors
   d) Age limits
   e) Relaxation

14. _____ As of 2010, how many states had comprehensive smoke-free laws prohibiting smoking in worksites, restaurants, and bars?
   a) 5
   b) 9
   c) 37
   d) 25
   e) 42

15. Although three-fourths of the largest cities in the United States ban cigarette smoking in bars, hookah tobacco smoking may be permitted in nearly _____% of these cities via exemptions in clean indoor air laws that permit hookah smoking in smoke shops.
Appendix O

Dissertation Research Invitation E-mail to Instructors (Electronic Primary Data Collection)

**Email Subject:** Dissertation Research Invitation

Greetings _________________ (insert instructor’s name),

My name is Hannah Priest and I am a doctoral candidate of Health Education and Health Promotion in the Department of Health Science. As part of my dissertation, I am examining theory of planned behavior predictors of human papillomavirus vaccination intentions among college students for an original research project (IRB #14-OR-411).

I am seeking students to complete a 41-item questionnaire, estimated to take about 20 minutes to complete. Participants may complete the questionnaire on their own time. I am kindly requesting permission to recruit students from your ________ (insert class name: HHE 270, HHE 273, HHE 370, HHE 378, HHE 440, HD 101, NHM 101, CSM 204, GBA 300, etc.) classes through e-mail for the ____________ (spring 2015/summer 2015 semester). This process would entail you forwarding an email invitation from me to your students. If possible, I would like to attend your class and explain the study and its procedures though this is not required in order for your students to participate. **I am also requesting that instructors offer up to 5 bonus points for students’ participation in the study.** I am offering a time-equivalent, incentive-equivalent, alternative activity for students who do not wish to participate in the study, or do not meet the inclusion criteria. The alternative activity entails reviewing a brief handout about hookah, and responding to 16 multiple choice, true/false, and fill-in-the-blank questions. After I collect data from your students, I will send you a “Hookah Use Answer/Feedback Sheet” via e-mail that you may forward to students in your class. I will also provide you with a list of students who participated in the study or completed the alternative activity so that you can allocate bonus points accordingly.

If you are willing, please let me know via e-mail. My e-mail address is hmpriest@crimson.ua.edu. If you have any questions I can also be reached at (XXX)-XXX-XXXX.

Thank you in advance for your willingness to support my research efforts.

Regards,

Hannah M. Priest, CHES, MAED
Appendix P

Study Invitation E-mail to Students (Electronic Data Collection)
E-mail Message Subject: HPV Vaccination Opinions Study Invitation

Dear Prospective Participant:

I am a doctoral candidate at The University of Alabama pursuing my Ph.D. in Health Education/Health Promotion. I am conducting a research study called “Validation of a Theory of Planned Behavior-based Instrument to Predict Human Papillomavirus (HPV) Vaccination Intentions of College Students.” I hope to find out college students’ opinions about getting the HPV vaccine. I am requesting that you share your opinions about this important issue by completing a brief online questionnaire.

Please note that to participate in this study you must be:

- A student at The University of Alabama
- Between 18 and 26 years of age
- Who has not taken any doses (shots) of the HPV vaccine.

Taking part in this study involves completing a 41-item web questionnaire that will take about 20 minutes to complete. By clicking on the link below, you will be re-directed to the questionnaire. Three screening questions will be presented at the beginning of the questionnaire to determine your eligibility to participate in the study. If you do not meet the eligibility criteria, you will automatically be re-directed to the alternative activity. If you qualify for the study but do not wish to participate in it, you will be given the option to complete the alternative activity instead. The alternative activity will ask you to read a handout about hookah use and answer 16 multiple-choice, true/false, and fill in the blank questions. It will take about 20 minutes to complete. The deadline to complete the survey or alternative activity is __/__/____ year by __ AM/PM, Central Standard Time. This same e-mail message will be forwarded again from your instructor approximately one week prior to the close of the survey and alternative assignment.

<QUESTIONNAIRE LINK>

Please rest assured that the website you will be directed (Qualtrics.com) to is completely safe and used regularly by universities for academic research. Your participation is completely voluntary. You are free not to participate or stop participating any time before you submit your answers. Please note there is no right or wrong answer to any of the questions in this survey.

Your participation in this study presents two potential benefits for you: (1) receipt of up to 5 bonus points in the course in which you were recruited to complete the questionnaire, and (2) an increase in knowledge about HPV and HPV vaccine.

The results of this study will help health education researchers develop more effective programs to increase HPV vaccination intentions in college students. As a result, society could benefit from a lower prevalence of HPV infection and associated diseases. There are no physical risks or discomforts in this study. The psychological risks of participating in this study are minimal. Should you experience such discomfort, I will inform you about counseling services offered by the University of Alabama Counseling Center.

To receive extra credit for completion of either of the surveys or alternative activity, you must type your first and last name, along with your instructor’s name, course title, and section number on the last page of the questionnaire. However, your name will remain confidential. Your name will only be collected to ensure that you receive the incentive (bonus points). Group data may be presented or published for scientific purposes; however, the information you provide cannot be linked to you. Please note you do not have to accept the extra credit to participate in this study, in which case you do not have to provide your name.

Only the principal investigator and co-investigators will have access to the data. The data will be password protected. Please know that your responses and any information that could be used to identify you will remain strictly confidential. Thank you in advance for your assistance with this valuable research.

If you would like an overview of the study and its procedures, please view the PDF attachment (Student Recruitment PowerPoint). If you have questions about this study, please contact Hannah Priest at (XXX) XXX-XXXX or by email. If you have questions about your rights as a research participant contact Ms. Tanta Myles (Director of Research Compliance) at (205) 348-8461 or toll-free at 1-877-820-3066. If you have complaints or concerns about this study, file them through the UA IRB outreach website at http://osp.ua.edu/site/PRCO_Welcome.html. Also, if you participate, you are encouraged to complete the short Survey for Research Participants online at this website. This helps UA improve its protection of human research participants.

Sincerely,
Hannah M. Priest, CHES, MAED
Graduate Assistant, Department of Health Science
(XXX) XXX-XXXX
hmpriest@crimson.ua.edu

Institutional Review Board Study #14-OR-411 (APPROVED 12-02-14)
Appendix Q

Electronic Version of Hookah Use Alternative Activity

Screen 1

Alternative Activity
Hookah Use

Instructions: After reading the passage below, please respond to the questions on the pages that follow. If you would like to receive bonus points, please be sure to complete the Extra Credit Sheet on the last page of the survey.

Hookah Overview

- Hookahs are water pipes that are used to smoke specially made tobacco that comes in different flavors, such as apple, mint, cherry, chocolate, coconut, licorice, cappuccino, and watermelon. \(^1,2\)
- Although many users think it is less harmful, hookah smoking has many of the same health risks as cigarette smoking. \(^1,2\) Hookah is also called nargile, argileh, shisha, bubble-bubble, and goza. \(^1,2\)
- Hookahs vary in size, shape, and style. \(^3\)
- A typical modern hookah has a head (with holes in the bottom), a metal body, a water bowl, and a flexible hose with a mouthpiece. \(^3,4\)
- Hookah smoking is typically done in groups, with the same mouthpiece passed from person to person. \(^1,2,3,4\)

Tobacco users should quit all tobacco products to reduce health risks.

Hookah smoking is NOT a safe alternative to smoking cigarettes. \(^1\)

Hookah Use

- Hookah use began centuries ago in ancient Persia and India. \(^1,2,3,4\)
- Today, hookah cafes are gaining in popularity around the world, including Britain, France, Russia, the Middle East, and the United States. \(^5\)
- Hookah use by youth \(^1,2,3,4\) and college students is increasing. \(^6\)
- In 2010, the Monitoring the Future survey found that among high school seniors in the United States, about 1 in 5 boys (17%) and 1 in 6 girls (15%) had used a hookah in the past year. \(^7\)
- Other small studies of young adults have found high prevalence of hookah use among college students in the United States. These studies show past-year use ranging from 22% to 40%. \(^5\)
  - New forms of electronic hookah smoking, including steam stones and hookah pens, have been introduced. These products are battery powered and turn liquid containing nicotine, flavorings, and other chemicals into a vapor, which is inhaled. \(^8\)
- Very little information is currently available on the health risks of electronic tobacco products. \(^6\)
Screen 2

Health Effects

Using a hookah to smoke tobacco poses serious health risks to smokers and others exposed to the smoke from the hookah.

Hookah Smoke and Cancer

- The charred coal used to heat the tobacco can raise health risks by producing high levels of cancer-causing chemicals.1,2
- Even after it has passed through water, the smoke from a hookah has high levels of these toxic agents.2,3
- Hookah tobacco and smoke contain several toxic agents known to cause lung, bladder, and oral cancers.1,2
- Tobacco juices from hookahs irritate the mouth and increase the risk of developing oral cancer.1,2

Other Health Effects of Hookah Smoke

- Hookah tobacco and smoke contain many toxic agents that can cause clogged arteries and heart disease.1,4 Infections may be passed to others by sharing a hookah.2
- Babies born to women who smoked water pipes every day while pregnant weight less at birth (at least 3% lower) than babies born to nonsmokers.2,5
- Babies born to hookah smokers are also at increased risk for respiratory diseases.1

Hookah Smoking Compared With Cigarette Smoking

- While many hookah smokers may think this practice is less harmful than smoking cigarettes, hookah smoking has many of the same health risks as cigarette smoking.1,2
- Water pipe smoking delivers nicotine—the same highly addictive drug found in other tobacco products.2 The tobacco in hookahs is burned versus high heat and the smoke is at least as toxic as cigarette smoke.1,2,2
- Because of the way a hookah is used, smokers may absorb more of the toxic substances also found in cigarette smoke than cigarette smokers do.1,2
- An hour-long hookah smoking session involves 200 puffs, while smoking an average cigarette involves 20 puffs.1,2
- The amount of smoke inhaled during a typical hookah session is about 90,000 milliliters (ml), compared with 500–600 ml inhaled when smoking a cigarette.1

Hookah smokers may be at risk for some of the same diseases as cigarette smokers.
- These include:1,2
  - Oral cancer
  - Lung cancer
  - Stomach cancer
  - Cancer of the esophagus
  - Reduced lung function
  - Decreased fertility

Hookahs and Secondhand Smoke

- Secondhand smoke from hookahs can be a health risk for nonsmokers. It contains smoke from the tobacco as well as smoke from the heat source (e.g., charcoal) used in the hookah.1,2,2

Nicotine in Hookah Products

- Some sweetened and flavored nicotine products are sold for use in a hookah.1
- Labels and ads for these products often claim that users can enjoy the same taste without the harmful effects of tobacco.1
- Studies of tobacco-based devices and "fruitful" shisha show that smoke from both preparations contains carbon monoxide and other toxic agents known to increase the risks for smoking-related cancers, heart disease, and lung disease.2,3

Please proceed to the next page...
Screen 3

Note: The text provided for this activity was extracted from the following resource:


References


Screen 4

Which of the following is not another name for hookah?

- Narghile
- Shisha
- Shiksho
- Ciga
- Argish

Hookah is typically smoked in groups, with a different mouthpiece for each person.

- True
- False

The charcoal used to heat the tobacco can raise health risks by producing high levels of _________, _________, metals, and _________ causing chemicals.

Fill in the Blank #1: (two words)

Fill in the Blank #2

Hookah use among college-age students is declining.

- True
- False

Secondhand smoke from hookahs can be a health risk for nonsmokers.

- True
- False
Screen 5

Which of the following is NOT a health risk faced by hookah smokers?
- Oral cancer
- Decreased fertility
- Lung cancer
- Pancreatic cancer
- Bladder cancer

__________ may be passed to other smokers by sharing a hookah.
Fill in the Blank

The smoke from hookah tobacco is at least as toxic as cigarette smoke.
- True
- False

Due to the way hookah is used, hookah smokers may absorb less of the toxic substances also found in cigarette smoke than cigarette smokers do.
- True
- False

Hookah tobacco delivers __________ the same highly addictive drug found in other tobacco products.
Fill in the Blank

Screen 6

Where did hookah use originate? Answer: __________, __________, and __________
Fill in the Blank #1 (two words)
Fill in the Blank #2

Which countries are hookah cafes gaining popularity around the world?
- France
- Russia
- United States
- All of the above
- Answer: countries Russia and United States only

According to a 2010 survey, what percentage of high school seniors used hookah in the past year?
- 17% (boys), 15% (girls)
- 15% (boys), 17% (girls)
- 24% (boys), 12% (girls)
- 13% (boys), 24% (girls)
- 14% (boys), 17% (girls)

How does an hour-long session of hookah smoking compare to smoking a cigarette?
- An hour-long hookah session involves 150 puffs, while smoking an average cigarette involves 260 puffs.
- An hour-long hookah session involves 60 puffs, while smoking an average cigarette involves 260 puffs.
- An hour-long hookah session involves 260 puffs, while smoking an average cigarette involves 60 puffs.
- An hour-long hookah session involves 200 puffs, while smoking an average cigarette involves 20 puffs.
- An hour-long hookah session involves 260 puffs, while smoking an average cigarette involves 200 puffs.

Screen 7

Extra Credit Sheet

To receive bonus points for your participation, please provide the following information below. This information will be separated from your responses by the principal investigator as soon as the data is downloaded. Thus, there will be no way to link your questionnaire responses to you.

If you do not wish to receive extra credit please proceed with the survey by clicking the arrow at the bottom of the page.

Your First and Last Name
Instructor's First and Last Name
Course (i.e., HHE 270)
Section (i.e., 001)
We thank you for your time spent taking this survey.
Your response has been recorded.