Summer 2021

Market Segmentation and Targeted Messaging to Improve HPV Vaccine Intentions in the College Aged Population

Ashley Caitlin Godwin

MARKET SEGMENTATION AND TARGETED MESSAGING TO IMPROVE HPV VACCINE INTENTIONS IN THE COLLEGE AGED POPULATION

by

Ashley Caitlin Godwin

Bachelor of Science
University of South Carolina, 2016

Submitted in Partial Fulfillment of the Requirements

For the Degree of Doctorate in Philosophy in

Pharmaceutical Sciences

College of Pharmacy

University of South Carolina

2021

Accepted by:

Tessa J. Hastings, Major Professor

Claiborne E. Reeder, Committee Member

Kealy Carter, Committee Member

Cynthia Phillips, Committee Member

Brian Chen, Committee Member

Stephen Cutler, Committee Member

Tracey L. Weldon, Interim Vice Provost and Dean of the Graduate School

ACKNOWLEDGEMENTS

I want to thank my dissertation chair, Dr. Hastings, for all she has done over the past year and a half for me. As soon as I found out that Dr. Hastings was joining the department, I knew that I wanted her to be my advisor. I gave her about a month to settle in before I requested a meeting and officially asked her to help me. She has always encouraged me to pursue my ideas and provided me with the tools necessary to succeed. She holds me to a high standard yet also will tell me when I do a great job. My only complaint is that I didn't get enough time with Dr. Hastings. I wish she had started working at our college a few years ago! Dr. Hastings, thank you for going above and beyond to help me grow. You have always made time for me, even if it meant meeting three times in one week. I will forever be thankful for you and the constant faith that you had in me.

I want to thank Dr. Carter (Kealy) for inspiring me to pursue a career in marketing research. I never knew what marketing research was until I took her class in the Spring of 2019. Before then, I had no idea of what I wanted to do after I graduated and definitely didn't know what I would do a dissertation on. I wasn't passionate about any particular subject until I took this class. Kealy, you are my market research superhero. I once told Dr. Reeder that I wanted to be you when I grew up, and he told me that I picked a great person to emulate.

I want to thank Dr. Reeder for being the person that he is. He is constantly trying to make the graduate program bigger and better. He has always handled our forms and deadlines and tried his best to make everything easier for us. Dr. Reeder is the one that encouraged me to apply for this graduate program, at a time when I was lost and had no idea what to do next. Dr. Reeder, thank you for looking after all of us and doing whatever was needed to ensure that we stayed on the right path. Thank you for your role in helping me secure funds to pay for this study!

I want to thank Dr. Phillips for being my TA supervisor for the past three years. Dr. Phillips was not assigned to be my supervisor, but instead volunteered for the job because she knew that I would need someone to guide me. She didn't even know me, and she volunteered to help me. Over the past few years, she has been my confidant and advisor, on matters even beyond teaching. She would always stop by my office to say hello or listen to whatever I was struggling with. Dr. Phillips, I would not have gotten through graduate school without you. I am so thankful for your kindness years ago when you decided to help a young graduate student find her way.

I want to thank Dean Cutler for being the most accessible dean that I know. I met Dean Cutler at the White Coat ceremony is 2016, when I was entering my first year of pharmacy school. Over the years, he always made time for me to meet with him and talk about career aspirations and how to get there. He is committed to making this program better for all students, including the graduate students. Dean Cutler, it meant the world to me that you were so enthusiastic about being a member of my committee.

I want to thank Dr. Chen for being an inspiration to me from day one of meeting him through SONAR. I was fortunate enough to get to know Dr. Chen as a colleague first

and then took his Health Law course in 2018. I remember answering a question correctly one day and him saying “did you go to law school already?” When someone like Dr. Chen gives you a compliment, it sticks with you for years. Dr. Chen, it has been an honor to have you on my committee. Thank you for always making my meeting times work, even when you were twelve hours ahead in Taiwan. Your confidence in me and my project has meant the world to me.

This acknowledgements page would be lacking without mentioning a few more people. Dr. Shaw, thank you for the many letters of recommendation over the years as I navigated what I wanted to do. You have always been my “life advisor” and will continue to be even as I leave the world of academia behind. Thank you for believing in me all those years ago, when you asked me to work in your lab. Dr. Yunusa, thank you for being my lifeline as I applied to jobs this past year. You helped me tweak my resume and prep for interviews. You are a big part of why I got my job in Boston. I wish you had joined the College of Pharmacy sooner! Dr. Khazan, thank you for your friendship and support over the last three years. I always considered you as one of my College of Pharmacy “moms” and knowing that I could talk to you if I had a bad day really made a huge difference. Speaking of College of Pharmacy family, thank you Erin Anderson for being my College of Pharmacy “big sister.” Since you started before me, you were able to share tips and tricks. You always listened to my problems and supported me at milestones. Dr. Bennett, thank you for taking a chance on me and hiring me to work for SONAR while I figured out next steps for my graduate career. I enjoyed talking about life-changing papers in your office and planning the next big thing for the SONAR team. Through you, I met so many amazing individuals across the US and Canada. Thank you for helping me

learn to look at things in a different perspective and ask questions. Dr. Cai, thank you for the statistics support and encouragement when I was feeling overwhelmed by variables and tables. Dr. Love, thank you for your guidance on survey design and market research panels—as well as letting me borrow your poster tube for the ASCO 2019 conference. Emily Stauffer, you devoted so much time to our systematic review and qualitative analysis. Thank you for always working with me and staying positive. You were my lifeline during qualitative analysis! Last but not least, thank you Sarah Beth Tucker, Abdul Alnijadi, Shawn Xiong, and Abby Davies for always letting me pre-test surveys and interviews and brainstorm ideas.

Finally, I need to give my family an enormous thank you. Mom, you have always been my biggest champion. Thank you for always making sure I had a home-cooked meal to keep me going while I was working. Thank you for always making the time to talk about this project—literally every single day for the past year. Thank you for always taking breaks with me to sit outside and enjoy watching the birds. You have always shown me such great love and support, and I couldn't have done this without you. Dad, thank you for always being there when I needed a break. You have always had faith in me even when I myself didn't. Thank you for the much needed tv breaks watching Buffy the Vampire Slayer, Malcolm in the Middle, The Expanse…Thank you to my grandparents for always being another much needed source of support. Mimi, you have helped me get through some of my biggest hurdles and I will be forever grateful to you! Thank you for always making the time for me even though you are so busy yourself. To my Uncle Tom, and Aunt Chari—thank you for always being so encouraging and

supportive of what I do. I feel especially thankful for you as I finish up the last edits while in Connecticut! I love all of you so much!

ABSTRACT

Background: Human Papillomavirus (HPV) is a sexually transmitted infection that can lead to 6 different types of cancer, including cervical, vaginal, vulvar, penile, anal, and oropharyngeal cancer. Every year in the United States, nearly 35,000 cancer cases are estimated to be caused by HPV infection. While catch-up HPV vaccination is recommended through age 26 for those not previously vaccinated, only 21.5% of adults age 18-26 have completed the recommended number of HPV vaccine doses as of 2018. Many interventions have been tested to increase vaccination rates, and one such intervention, framed messaging, has shown promise in increasing intention to vaccinate. Tailored messages, targeted to patient-specific characteristics, may be more successful in improving vaccination uptake. This study proposes a novel way to increase HPV vaccination intention within this population by conducting a market segmentation and testing developed messages for effectiveness in increasing intention to vaccinate.

Methods: Semi-structured interviews were conducted to elicit barriers and facilitators of HPV vaccination. Individuals between the ages of 18 and 26 who had not yet received the vaccine, had partially completed the vaccine series, and who had completed the series were interviewed. A cross-sectional survey was used to conduct a market segmentation of this population. Promotional HPV vaccination messages were developed and tested for effectiveness in increasing intention to vaccinate. Qualtrics

panels was used to recruit participants, including both males and females between the ages of 18 and 26.

Results: Through the qualitative interviews, it was found that cues to action was a strong facilitator of HPV vaccination intention. Subjective norms and perceived severity both had a mixed influence on intention, while perceived susceptibility, perceived barriers, and relationship status all played roles as barriers to intention. Through a hierarchical clustering technique, six segments were found to exist within this population. The first segment, "Keeping up with the Kardashians," places a high importance on subjective norms. Segment #2, "Every day is a challenge," faces the highest vaccine access barriers. Segment #3, "On the fence," has safety concerns regarding the HPV vaccine and needs an in-depth discussion about the safety of this vaccine. Segment #4, "Busy (Intelligent) Bees," wants this vaccine and has the highest knowledge scores out of all segments but faces the greatest time barriers. Segment #5, "That doesn't apply to me, does it?" has the highest mean barriers, vaccine belief, and risk perception barriers. Segment #6, "No idea and not interested," lacks knowledge and needs education about both HPV and the HPV vaccine in order to influence their intentions to vaccinate.

Interview participants reported a preference for four main types of messages to promote HPV vaccination: facts, personal, fear, and emotional. Based upon these results as well as the literature, nine messages and a control message were tested in their ability to improve baseline intentions. Messages 3 and 5, both Murdock style messages, increased intention within multiple segments. However, each segment had unique message preferences, underscoring the value of a targeted messaging approach.

Conclusions: This study represents a novel approach in conducting a market segmentation and testing targeted messaging to improve HPV vaccination intentions among adults 18-26 years of age. Based upon the results, it is evident that different segments need their own unique approach and messaging to improve intentions to vaccinate. This study provides the tools necessary for healthcare providers to identify and target HPV vaccine messaging to patients' unique barriers.

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LIST OF ABBREVIATIONS

ACS ..... American Cancer Society

CDC..... Centers for Disease Control

FDA..... Food and Drug Administration

HPV..... Human Papillomavirus

STD ..... Sexually Transmitted Disease

STI..... Sexually Transmitted Infection

WHO..... World Health Organization

CHAPTER 1

INTRODUCTION

HPV is a common STI that causes cancer. HPV is the most common sexually transmitted infection (STI) in the United States, with currently 80 million Americans infected, and with many showing no signs or symptoms of infection. With each new year, approximately 14 million Americans are newly infected. There are over 100 types of HPV, 14 of which cause cancer(CDC, 2020a, 2020b; Human Papillomavirus (HPV) and Cervical Cancer, n.d.). Every year in the United States, nearly 35,000 cancer cases are estimated to be caused by HPV infection. Many immediately associate HPV with cervical cancer, but it is important to realize that HPV can lead to six different types of cancer—cervical, vaginal, vulvar, penile, anal, and oropharyngeal(CDC, 2020a). This is not just a women's health issue—both men and women are at risk to develop HPV-related cancer.

To prevent cancer and other complications associated with HPV, the Centers for Disease Control and Prevention (CDC) recommend that all boys and girls aged 11-12 receive two doses of the HPV vaccine, Gardasil. The vaccine can be given starting at age 9. If the vaccine is initiated after age 15, three doses are required. The vaccine is recommended through age 26 for all persons previously not vaccinated(CDC, 2020c). Getting the HPV vaccine can prevent up to 90% of HPV-related cancers and has been shown to be both safe and effective(CDC, 2020b).

HPV vaccination rates are not at the level they need to be, especially within the 18-26 year old population. For those that were previously not vaccinated, the catch-

up period continues through age 26(CDC, 2020c). The 18-26 year old population is the focus of this study, since this age range defines the "catch-up" period for HPV vaccination and an opportunity to be protected against HPV-related cancer and complications. Rates of HPV vaccination are increasing, but not as fast as expected. As of 2018, 51.1% of teens aged 13-17 years old in the US were up to date on HPV vaccination(Walker et al., 2018). However, for adults aged 18-26, only 21.5% of them had completed the recommended number of HPV vaccine doses as of 2018(Boersma & Black, 2020). If a vaccine exists that can prevent HPV-associated cancer, one would think that everyone would want to be vaccinated. We know that this is far from the case. Rates of uptake and compliance of the HPV vaccine are low within the adolescent population—and when looking at rates within the 18-26 year old population, we find that the rates are even lower.

The 18-26 year old population is in a unique position to accept the HPV vaccine but often face unique barriers. The HPV vaccine is recommended to be started early, preferably at age 11 or 12. Because of this, the responsibility of vaccine uptake and compliance relies on parents or guardians. However, when one is over the age of 18, they are considered an adult, and this puts them in a unique position to now take responsibility and control over their own health. The "catch-up" period is just that—an opportunity to catch up on missed vaccinations, and an opportunity to protect oneself from HPV and HPV-related cancer.

This may sound easy, but this population still faces many barriers to HPV vaccination. Adequate and correct knowledge of HPV and the vaccine is just one barrier for this population(Dibble et al., 2019; Ferrer et al., 2014; Hirth et al., 2018; Rambout et

al., 2014). In a recent systematic review, it was found that many young adult males still believe that HPV only affects females(Dibble et al., 2019). Other barriers to HPV vaccination include safety and effectiveness concerns, lack of a provider recommendation, and stigma, among others(Hirth et al., 2018; Pierre-Victor et al., 2018; Rambout et al., 2014).

Despite research on barriers and facilitators of HPV vaccine uptake in this population, there is a lack of evidence on which interventions are most effective in achieving the desired level of vaccination. Many interventions have been tested to increase vaccination rates, including patient education programs, reminder and recall systems, and technology-based interventions(Smulian et al., 2016). One intervention, framed messaging, has shown promise in increasing intention to vaccinate. However, more research is needed to determine the effectiveness of messaging interventions on HPV intention and uptake.

We know that a provider recommendation is one of the strongest motivators of vaccination(Rosenthal et al., 2011). In fact, one study found that within the 18-26 year old population, those that received a provider recommendation were 35 times more likely to receive one or more doses of the HPV vaccine(Gerend et al., 2016). However, this study also found that provider recommendations varied depending on the characteristics of the patient. Tailored messages, targeted to patient-specific characteristics, may be more successful in improving vaccination uptake(Gerend et al., 2013).

We need to understand which HPV vaccination promotional messages work. Message framing has been shown to be effective in promoting healthy behavior in certain circumstances. Messaging studies focusing on the HPV vaccine have shown promising

results for potentially increasing intention or actual uptake(Gerend et al., 2008; Gerend & Shepherd, 2007a; Nan, 2012b; Park, 2012). However, more information is needed. Messaging often needs to be tailored to the individual in order to be more effective(Baxter & Barata, 2011; Gerend et al., 2013). It seems that there is not a one size fits all message that will convince the entire 18-26 year old population to get vaccinated. A market segmentation of this population, as done in this dissertation, will allow us to create targeted and more effective messages for each segment of our population, instead of trying to use one message for all. These tailored messages can be used by providers when recommending the HPV vaccine to their patients.

Problem Statement

When a vaccine has been proven to prevent cancer, it is essential to ensure that that vaccine has the highest rates of uptake among the population. For the HPV vaccine, rates of uptake within the US are still low, especially within the 18-26 year old population. This vaccine is recommended to be started at age 11 or 12, but the catch-up period lasts until age 26. It is essential to ensure that rates of HPV vaccine uptake improve across all age groups, but especially in the age group of 18-26. This catch-up period represents an opportunity for this population to be fully protected against HPV and HPV-related cancers. We need to understand which promotional messaging is most effective in ensuring that this population gets vaccinated.

The **purpose of this study** was to examine the motivators and deterrents of HPV vaccination as an avenue to develop more effective messaging to improve HPV vaccination intention in the 18-26 year old population. The **long-term goal** is to improve HPV vaccination uptake within this population. The **research design** was a mixed

methods approach to qualitatively identify the barriers and facilitators of HPV vaccination, define the segments within this market and understand each segment's preferences as related to the HPV vaccine, develop targeted promotional messages to improve HPV vaccination intention, and quantitatively assess which messages were most effective within each segment.

Specific Aims

Aim 1: To identify barriers and facilitators of HPV vaccine uptake in the 18-26 year old population. This aim was accomplished through qualitative interviews of both males and females within this age group to understand the barriers and facilitators of HPV vaccine uptake and series completion.

The semi-structured interviews of approximately 30 minutes in length contained open-ended questions to elicit participants' views, beliefs, perceptions, and barriers or facilitators related to HPV and the HPV vaccine.

This study included a purposive sampling of 21 University of South Carolina students and non-students within the 18-26 year old age range. Both participants who had and had not received the HPV vaccine were interviewed. Additionally, interview participants were selected to have maximal variation in terms of gender, HPV vaccination status, socioeconomic status, race/ethnicity, and age.

Through these interviews, the barriers and facilitators of the HPV vaccine as viewed by the 18-26 year old population were identified as well as a general idea of potential segments within this population. These interviews were essential to the development of the segmentation survey used in Aim 3.

Aim 2: Conduct a market segmentation of this population based on preferences and beliefs about the HPV vaccine. A survey was used to further define the segments within this 18-26 year old age group. The survey enabled us to understand the characteristics and preferences of each segment.

Using the information gathered through qualitative interviews and the current literature on the subject, a national cross-sectional survey was developed to determine the number of segments within this population. The survey was used to define the segments and learn more about characteristics of individuals in each segment, including knowledge level, attitudes, and perceptions related to HPV and the vaccine. Our target population was 18-26 year old males and females within the US. To ensure a representative and large enough sample size, a Qualtrics panel was utilized.

Segmentation was determined using a Hierarchical Clustering approach. Segmentation was based upon variables collected in the survey, including knowledge level, attitudes, barriers, and personal characteristics in reference to HPV and the HPV vaccine. Different numbers of segments were analyzed to determine which number makes the most sense.

This resulted in a distinct number of segments that differ on key characteristics which influence adoption and compliance with the vaccine. Each segment contains individuals that share similar beliefs and attitudes. Having this knowledge will allow us to tailor messages for each segment, instead of creating one message that is meant to influence all segments.

Aim 3: Test targeted promotional messaging to determine which messages are effective in increasing vaccination intention rates. Targeted promotional messages

were developed and tested for effectiveness in increasing intention. Messages were created based upon the results from the Aim 1 interviews as well as the systematic review conducted on message framing used to increase HPV vaccination rates in the college-aged population. After the targeted messages were developed, they were tested through a national cross-sectional survey to evaluate their effectiveness in increasing intention to vaccinate. Participants were randomized to a particular message, this allowed us to test the messages across multiple segments, identifying if one message is effective for multiple segments, or if each segment needs their own targeted message.

Innovation

With the catch-up period for HPV vaccination lasting until age 26, this gives this age group an extended opportunity to get vaccinated. However, many still have barriers to getting the vaccine. By defining the segments within this population, we were able to understand both the barriers and facilitators of HPV vaccination based upon which segment an individual belongs to. Messaging studies have attempted to address barriers or tailor messages based upon individual characteristics, but a true segmentation study allowed us to understand much more about this population and know which messaging works for which group of individuals.

This study is the first to use marketing segmentation to create targeted promotional messages aimed to increase HPV vaccine intention within the 18 to 26 year old population. To our knowledge, no prior research has sought to define the segments within this population and to create and test targeted messages to these segments. The results of this study will enhance our understanding of the knowledge, attitudes,

perceptions, and behaviors of this population and allow us to create tailored messaging based on individual characteristics.

The information gathered throughout this study and the methodology used has practical use in other populations. We can use this methodology to define other segments and create tailored messages to other age groups, all with the end goal of improving HPV vaccination coverage.

Significance

This dissertation aimed to better understand the barriers and facilitators of HPV vaccination within the college-aged population and used this information to create targeted promotional messaging aimed at increasing intention rates. While the methodology of the process is certainly innovative, the overall significance of this study needs to be acknowledged. HPV represents a serious public health threat in the fact that many individuals with HPV have no signs or symptoms of the infection and have the possibility of spreading the infection to others. Many may not have short-term repercussions from an HPV infection but can develop HPV-related cancer later in life. Because of this, it is extremely important to be diligent in our efforts to prevent HPV infection. There is a vaccine available that has been proven to be safe and effective in preventing HPV-related complications and cancers, yet vaccination rates remain low. This study explores barriers and facilitators to vaccination and identifies messaging strategies to increase vaccination rates.

This study aims to focus on these goals within the context of the 18-26 year old population. This represents the “catch-up” period of HPV vaccination, a final opportunity to be fully protected by getting the vaccine. This population also has the lowest rates of

HPV vaccination, which represents an enormous problem. Identifying effective messaging strategies may improve vaccination rates and help to reduce the impact of HPV-related complications and cancer.

HPV is a serious threat to public health. It causes six types of cancer and affects both men and women. No one is safe from HPV-related cancer—unless they get vaccinated as early as possible. This study will provide a key part of the information needed to increase HPV vaccination rates within the 18-26 year old population by understanding the barriers and facilitators of uptake, defining the segments that exist in this population through a market segmentation, and developing and testing promotional messaging across the segments.

CHAPTER 2

LITERATURE REVIEW

Introduction:

This literature review will be divided into 5 key sections. The first section, HPV and the HPV Vaccine, will discuss HPV and the HPV vaccine, vaccine eligibility, and the rates of uptake. The second section, Controversy Surrounding the Vaccine, will discuss a few examples of the controversy that has plagued this vaccine since its approval. The third section, Barriers and Facilitators of HPV Vaccination, will discuss the barriers and facilitators of vaccination within the context of the 5C Model. The fourth section, Interventions Used to Improve Uptake, will look at past interventions used to try to increase HPV vaccine intention or uptake. The last section, Theory, will discuss various theories related to vaccination and health decision-making. The focus of this research is on the 18-26 year old population and this literature review's aim is to focus on research related to this population of interest.

HPV and the HPV vaccine

HPV / Cancer: What is HPV?

Human Papillomavirus (HPV) is the most common viral infection of the reproductive tract and the most common sexually transmitted infection (STI) in the United States. There are over 100 types of HPV, 14 of which cause cancer

(CDC, 2020a; WHO 2020). Many immediately associate HPV with cervical cancer, but it is important to know that HPV can lead to six different types of cancer—cervical, vaginal, vulvar, penile, anal, and oropharyngeal(CDC, 2020a). This is not just a women's health issue. HPV poses the threat of cancer to both men and women, even after several decades of exposure to HPV (Meites, 2019).

The majority of sexually active men and women will become infected with HPV at least once in their lives(WHO, 2019). According to the Centers for Disease Control and Prevention (CDC), currently 80 million Americans are infected, with many showing no signs or symptoms of infection(CDC, 2020a). This is one of the most challenging parts about this infection, the fact that many experience no symptoms and have the potential to unknowingly spread the infection to others. Annually, approximately 14 million Americans are newly infected. Every year in the United States, nearly 35,000 cancer cases are estimated to be caused by HPV infection(CDC, 2020a, 2020c).

Vaccine

The good news? A vaccine does exist that can prevent certain cancers caused by HPV. There are currently three vaccines to prevent HPV, but only one is currently licensed for use in the US. The first vaccine, GARDASIL or HPV4, was licensed for use in females between the ages of 9 and 26 years old by the Food and Drug Administration (FDA) in June of 2006(Dunne, et al., 2011). This vaccine targeted Types 6, 11, 16, & 18, and was manufactured by Merck(Merck, 2020a). In 2009, HPV4 was licensed for use in males for the prevention of genital warts. In December of 2010, the prevention of anal cancer in males and females was added as an indication.

HPV2 or Cervarix, was licensed for use in females between the age of 10 and 25 years old in October of 2009. This bivalent vaccine manufactured by GlaxoSmithKline targets HPV Types 16 & 18(CDC, 2020d). Both HPV4 and HPV2 target HPV Types 16 & 18, which cause approximately 70% of cervical cancers. HPV Types 6 & 11, covered by HPV4, cause approximately 90% of genital warts and most cases of recurrent respiratory papillomatosis.

GARDASIL 9 or 9vHPV, manufactured by Merck, was originally approved by the FDA in 2014. It was originally indicated for girls and women between the ages of 9 and 26 for prevention of cervical, vulvar, vaginal, and anal cancer caused by certain HPV types. The indication also included prevention of genital warts and precancerous or dysplastic lesions caused by various types of HPV. GARDASIL 9 was originally indicated for boys between the ages of 9 and 15, for the prevention of anal cancer, genital warts, and precancerous or dysplastic lesions caused by various HPV types(FDA, 2014).

9vHPV is the only vaccine currently licensed for use in the US. It protects against cancers and diseases caused by nine types of HPV: 6, 11, 16, 18, 31, 33, 45, 52, and 58. To put this into perspective, this vaccine is estimated to protect against 92% of the cancers caused by HPV(Senkomago, 2019). The vaccine requires two or three doses, depending on how early the series is started and the recommendation of the healthcare professional. Usually, two doses are sufficient for those between the ages of 9 and 14 years old. Three doses are required for those above the age of 15(Merck, 2020a).

In 2015, the indication for 9vHPV was extended to include boys and men ages 16 to 26 years old(Sun, 2015). In 2016, a two-dose regimen was approved for boys and girls ages 9 to 14 years old(Sun, 2016). The indication was again extended in 2018, to include

men and women between the ages of 27 to 45 years old(Fink, n.d.). Merck announced in June 2020 that the vaccine's indications would again be expanded to include prevention of oropharyngeal and other head and neck cancers. Continued approval for this may be contingent on a confirmatory trial which is currently underway(Merck, 2020b).

Table 2.1: Gardasil Package Insert—Strains of HPV the vaccine protects against

Indications	Diseases	Caused by HPV Strains
Girls and women aged 9 to 45 years old	Cervical, vulvar, vaginal, anal, oropharyngeal and other head and neck cancers	16, 18, 31, 33, 45, 52, and 58
	Genital warts	6 and 11
	Precancerous or dysplastic lesions	6, 11, 16, 18, 31, 33, 45, 52, and 58
Boys and men aged 9 to 45 years old	Anal, oropharyngeal and other head and neck cancers	16, 18, 31, 33, 45, 52, and 58
	Genital warts	6 and 11
	Precancerous or dysplastic lesions	6, 11, 16, 18, 31, 33, 45, 52, and 58

Eligibility

The HPV vaccine is most effective when given prior to any exposure to HPV. The Advisory Committee on Immunization Practices (ACIP) recommends that both boys and girls ages 11-12 start the series(CDC, 2020c; Meites, 2019). The vaccine can be given to children starting at the age of 9 years old. The American Cancer Society recommends the required two doses of the vaccine to be completed between the ages of 9 and 12(ACS, 2020).

Depending on when the vaccine series is started, the individual will need either two or three total doses in order to be fully protected. If the series is begun before the age of 15, only two doses within a 6 month period are required. After the age of 15, three doses within a 6 month period are needed(CDC, 2020c).

While HPV vaccination is highly recommended to be started as early as possible, catch-up vaccination is recommended through age 26. This is because there are multiple strains of HPV. Even if an individual is already sexually active and has been exposed to one strain of HPV, they could still benefit from receiving the HPV vaccine and protection from other strains they may not yet have been exposed to. As of October 2018, the Food and Drug Administration (FDA) expanded the approved age for the 9vHPV vaccine to 45 years old. Previously the vaccine was only indicated through age 26. However, if anyone between the age of 26 and 45 wishes to get the vaccine, it is recommended that they consult with their doctor and participate in shared clinical decision-making. ACIP does not recommend the vaccine for those above the age of 26, nor does the ACS. Once past the age of 26, the public health benefit of getting the HPV vaccine is minimal. Most new HPV infections are acquired in adolescence or young adulthood. As stated above, the vaccine's effectiveness is at its highest when given to an individual who has not been exposed to any of the HPV strains the vaccine protects against (ACS 2020; CDC, 2020c; Meites, 2019).

Rates of uptake

Rates of vaccination are improving, but not fast enough. As of 2018, 51.1% of teens aged 13-17 years old in the US were up to date on HPV vaccination(Walker et al., 2018). From National Health Interview Survey data, US adults aged 18-26, only 39.9% had ever received one or more doses between 2013 and 2018. While this number did increase from only 22.1% in 2013, it is important to remember that the HPV vaccine requires 2-3 doses depending on when the individual begins the series. Only 21.5% of

adults aged 18-26 had completed the recommended number of HPV vaccine doses(Boersma & Black, 2020).

Rates of vaccination differed between men and women, with women more likely to have received at least one dose of the vaccine compared to men. In fact, the percentage of women who received at least one dose of the vaccine between 2013 to 2018 was 53.6%. Men had a percentage of only 27.0%. However, when looking at those that received all recommended doses, the percentages get even lower. Only 21.5% of adults aged 18-26 had received all recommended doses. When looking at percentages of women versus men, the percentage of women receiving all recommended doses was 35.3% compared to 9.0% of men receiving all recommended doses. For all survey years, this trend of women being more likely than men to receive one or more doses of the vaccine continued(Boersma & Black, 2020).

There were disparities in vaccination rates when looking at different race/ethnicities. 42.1% of non-Hispanic white adults received one or more doses in 2018, compared with 36.7% of non-Hispanic black adults, and 36.1% Hispanic adults. Again, women were more likely than men to have ever received one or more doses(Boersma & Black, 2020)

Disparities exist when looking at different geographic regions as well. Rural areas often have lower rates of HPV vaccine initiation and completion compared to metropolitan areas. This is compounded by the fact that HPV incidence rates are significantly higher in rural versus urban areas. When you add in the fact that rural areas often lack healthcare resources, this turns into an even bigger issue(Peterson et al., 2020).

When looking at adults who did receive at least one dose of the vaccine, men were more likely than women to have received their first dose between the ages of 18 and 26. In fact, 27.4% of men received their first dose during this time, compared to only 18.3% of women. The catch-up period of HPV vaccination lasts through age 26. As discussed previously, the vaccine is technically available for those above the age of 27, but not recommended by ACIP nor ACS. The key to this vaccine is to start the series as early as possible, and preferably prior to exposure to the virus. This is why the catch-up period is so important.

For South Carolina adults between the ages of 18 and 35 years old, only 13% had received at least one dose. It was found that significantly more non-Hispanic blacks and females received the vaccine compared to non-Hispanic whites and males, which differs from the US data previously discussed. This was found in both adolescents and adults. Adults of lower annual household income had significantly higher vaccination rates compared to adults of higher annual household income. There were no significant differences between rates of vaccination when looking at health insurance status, public health region, or adolescent's age (SCDHEC 2018).

HPV Vaccine Myths and Misinformation

Despite extensive safety testing and proven effectiveness, misconceptions surrounding the HPV vaccine still persist. This section will describe some of the myths and misconceptions surrounding the HPV vaccine, and the scientific evidence refuting each.

Myths: Myths remain one of the greatest challenges to science and healthcare. There are several myths and misconceptions surrounding HPV and the vaccine, some of

which will be highlighted within this section to understand what different people may believe about HPV and the vaccine.

One myth is especially concerning: women are the only ones who can get HPV. Not only is this not true, but it also has the potential to leave half of the population unaware and at risk for contracting HPV and spreading it to others. This directly ties in with the second myth: People with HPV will show symptoms. This is one of the reasons that HPV is so dangerous—the fact that many who have it show no signs or symptoms (Berkowitz, 2015).

The third myth: someone must have sexual intercourse to get HPV. Most cases are sexually transmitted, but the virus can still be spread through intimate skin to skin contact. Condoms can greatly help to prevent the spread of this virus, yet they do not offer 100% protection (Berkowitz, 2015).

The fourth myth: there are treatments available for HPV. Once someone is infected with HPV, there are only treatments for the symptoms. There is no cure for HPV. This is why protection against HPV by getting the vaccine is so essential (Berkowitz, 2015).

The fifth myth: Pap smears are sufficient to prevent cervical cancer. This myth delves into the misconception that HPV only causes cervical cancer, when HPV can cause six different types of cancer affecting both men and women. Pap smears are essential for identifying cervical pre-cancers, but do not detect any of the other HPV-related cancers. A pap smear simply isn't enough(Bednarczyk, 2019).

The sixth myth: The HPV vaccine is unnecessary since most people clear HPV infections naturally. It is estimated that 90% of new HPV infections are cleared by the

immune system within two years. HPV is one of the most common STIs, so if 10% of those infected do not clear the virus, this leads to a very large number of cancer and other HPV-related problems(Bednarczyk, 2019).

The seventh myth: Age 11 or 12 is too young to vaccinate. There are concerns over the vaccine having lasting effectiveness if given at a young age. There is also the idea from both parents and healthcare providers that the vaccine isn't needed until an individual becomes sexually active. Another concern is that by giving a child the vaccine, it gives them permission to become sexually active. Addressing the first two concerns, it has been shown that the vaccine is most effective when given at a younger age. HPV antibody titers have been shown to last between five and eight years at minimum, but modeling has estimated persistence over twenty years. Addressing the final concern, no research has found any evidence of an association between the HPV vaccine and promiscuity(Bednarczyk, 2019).

Table 2.2: HPV Myths

Myth	Rebuttal	Reference
Men cannot get HPV	HPV affects both men and women—can cause genital warts and lead to six types of cancer, affecting both men and women.	Berkowitz (2015)
If someone has HPV, they will show symptoms	Many who have HPV have no idea—because oftentimes HPV does not cause any signs or symptoms	Berkowitz (2015)
An individual has to have sex to get HPV	HPV can be spread through intimate skin to skin contact	Berkowitz (2015)
There are treatments or medicine available to cure HPV	There is no cure for HPV. An individual can only treat the symptoms of HPV infection, but not the infection itself	Berkowitz (2015)
Pap smears are enough to prevent cervical cancer	Since HPV causes six different types of cancer, a pap smear is not sufficient. It will not detect the other HPV-related cancers.	Bednarczyk (2019)
The HPV vaccine is unnecessary since	It is estimated that 90% of new HPV infections are cleared by the immune system	Bednarczyk (2019)

most people clear the HPV virus	within two years. HPV is one of the most common STIs, so if 10% of those infected do not clear the virus, this leads to a very large number of cancer and other HPV-related problems.	
Age 11-12 is too young to vaccinate	The HPV vaccine works most effectively if given prior to exposure to the virus—so prior to an individual becoming sexually active.	Bednarczyk (2019)
The HPV vaccine gives an individual permission to be sexually active or promiscuous	No research has shown evidence to support this claim.	Bednarczyk (2019)

There are many myths about HPV and the HPV vaccine. Hopefully this section provided an opportunity to take a look at some of these myths in more detail. This list is by no means exhaustive. As with anything, there are a multitude of beliefs about HPV and the vaccine that are often found to be untrue.

Barriers and Facilitators to Vaccination

Why Are Rates So Low?

The HPV vaccine has been proven to be safe and effective. Why are rates so low, especially in the 18-26 year old population? This next section will discuss in detail reasons for non-compliance.

Reasons for the choice to not vaccinate can include hesitancy, lack of confidence or trust, low acceptance, and many others. There have been several models developed that seek to explain and predict vaccination non-compliance. One of these models, the 5C Model, is said to measure the "psychological antecedents of vaccination," and uses theories of vaccine hesitancy and acceptance to help explain health behavior(Betsch et al., 2018).

The 5C Model is an updated version of the 3C Model, which included confidence, complacency, and convenience. These three items fail to tell the whole story though. The 5C model includes confidence, complacency, constraints, calculation, and collective responsibility.

Confidence involves trust in the safety and effectiveness of vaccines, trust in the healthcare system, and trust in the policy makers that are involved with promoting the vaccine. Complacency occurs when an individual has low perceptions of risk and feels that they do not need the vaccine for prevention of a disease. Constraints can include many things—physical availability, affordability and willingness-to-pay, geographical accessibility, language barriers, health literacy issues, and the appeal of the vaccination service affect uptake. Calculation involves the level of engagement with information searching. Collective responsibility refers to the willingness of the individual to vaccinate for the purpose of protecting others through the process of herd immunity(Betsch et al., 2018).

There are many barriers and facilitators of vaccination in general. In this section, we will describe some of the barriers and facilitators of HPV vaccination in the context of the 5C Model.

Confidence

In a systematic review describing the self-reported barriers to HPV vaccination faced by adolescent girls and young women conducted by Rambout et al. (2014), concerns about the safety of the vaccine was the third most common reason cited for non-compliance. The effectiveness of newer vaccines, and medicine in general, is often doubted(Hirth et al., 2018). Safety concerns related to this vaccine have even been

reported in those that are currently vaccinated(LaJoie et al., 2018). A recent study evaluated post-licensure surveillance reports to the Vaccine Adverse Event Reporting System (VAERS) from 2014 to 2017 for the current HPV vaccine and found that overall, 97.4% of all reports were nonserious. The most commonly reported side effects included dizziness, syncope, headache, and injection site reaction. Two reports of death within these reports were verified, but no causal relationship between the vaccine and death was suggested when looking at the autopsy reports or death certificates. The total number of reports within VAERS for the HPV vaccine was 7244 when looking at December 2014 to December 2017. No new or unexpected safety reports were identified within this study (Shimabukuro et al., 2019).

Many need an endorsement from a healthcare provider prior to getting a vaccine. For a group of Haitian undergraduate unvaccinated women, lack of a provider recommendation led to non-compliance(Pierre-Victor et al., 2018). This same group of Haitian women also had a few individuals feel that because the vaccine was not mandatory for school, it was not urgent that they receive the vaccine.(Pierre-Victor et al., 2018) Shared decision making can be a very important factor in the decision to vaccinate for HPV. For example, one study found that despite the smaller percentage, those college students that stated that a parent or guardian had helped them make the decision about vaccination were more often vaccinated than not(LaJoie et al., 2018).

Lack of confidence in the system promoting vaccines can be a deterrent to vaccination. For example, people may question the policy makers motivation for promoting a vaccine. A study on male beliefs towards the HPV vaccine found that many males questioned why the vaccine was withheld from males for a few years by the

pharmaceutical company. They also questioned whether it was a government conspiracy(Pitts et al., 2017).

Many are vaccine hesitant—they dislike vaccines, needles, and the whole process(Hirth et al., 2018; Pierre-Victor et al., 2018). It is important to distinguish between those that are hesitant about all vaccines compared to those that are hesitant about just the HPV vaccine. The HPV vaccine has certainly had its share of controversy, so it is understandable that some may be hesitant to receive this vaccine.

Lack of confidence can be related to certain beliefs or even misinformation. Some believe that they do not need the HPV vaccine because they are not sexually active. Some feel that because they are in a relationship, they are not at risk for HPV(Thompson et al., 2019). Some feel even more strongly, and think that the vaccine is only for those that are promiscuous(Pierre-Victor et al., 2018). Confidence in the HPV vaccine can also be related to how religious an individual is. One study found that highly religious undergraduates had lower levels of HPV knowledge, vaccination, and compliance(Birmingham et al., 2019).

Stigma can be an issue, especially when many view the vaccine as negative. The opinions of parents and friends has a major influence on the willingness of undergraduate students to get the HPV vaccine(Hirth et al., 2018). This makes sense, as subjective norms often can sway decisions.

A lack of information can also be an issue. Some know about HPV but have no idea that it can cause cancer. Some lack specific information about the vaccine and are unaware of the age recommendations and the required number of doses(Hirth et al., 2018;

Kellogg et al., 2019). A study interviewing undergraduate males found that some believed that it was “too late” for them to be vaccinated against HPV(Pitts et al., 2017).

It is difficult to promote a vaccine that has low overall awareness. A recent study looked at HPV and HPV vaccine awareness between 2008 and 2018 using the Health Information National Trends Survey (HINTS) data. They found that overall, awareness of both HPV and the HPV vaccine declined over the years. Racial minorities, rural residents, males, and those with the lowest educational and socioeconomic standing were among the respondents with the lowest awareness. They also found that between 2013 and 2018, awareness declined by 10% in those that were male, those that had a high school level of education or lower, and those that earned $35,000 or less annually(Chido-Amajuoyi et al., 2020). Awareness of HPV and the HPV vaccine is already a barrier to vaccination. The fact that rates of awareness are declining over time presents an even bigger challenge.

Complacency

In the systematic review by Rambout et al., the second most commonly cited reason for non-compliance was the feeling that the vaccine was unnecessary(Rambout et al., 2014). One study involving undergraduate students found that while most had knowledge of HPV, they had low perceptions of risk of contracting HPV(Barnard et al., 2017).

Apathy and dismissiveness towards the vaccine can be a factor. Sexual health isn’t a priority for some, leading to a lack of concern for protection. Some feel that HPV isn’t that big of an issue and that the consequences of getting it aren’t severe(Pitts et al., 2017).

Getting the HPV vaccine to prevent cancer is a future-oriented behavior. Those that are complacent, will not be future-oriented and instead will be more risk-seeking(Betsch et al., 2018). For those individuals that are future-oriented, a motivation for vaccination can be to minimize anticipated regret related to not getting the vaccine(Hirth et al., 2018).

Constraints

Cost can be a common barrier for vaccination. In the systematic review by Rambout et al. (2014), cost was the most commonly cited reason for non-compliance. Most insurance plans will cover the cost of the HPV vaccine for those within the age range dictated by national guidelines. However, for those that are uninsured or have a lack of coverage for this vaccine, there are programs that can help with the cost. The federal Vaccines for Children (VFC) program covers costs of vaccines for children and teens through age 18 that lack insurance(ACS, 2020). The manufacturer of the vaccine, Merck, also has assistance programs available to help out with the cost for those who are uninsured and/or making below a certain income level(Merck, 2020c).

Health literacy can play a role in vaccination status. One study found that while health literacy did not have a direct role in vaccination status, it was associated with higher levels of knowledge about HPV and HPV vaccines in undergraduate students(Albright & Allen, 2018).

Constraints can include access, time, and overall convenience. In one study, an undergraduate male talked about how he rarely went to the doctor, didn't know the area very well, and just didn't have the time anyways(Pitts et al., 2017). Others felt that they would forget to schedule the appointments or would forget to show up.(Hirth et al., 2018)

These are all constraints to HPV vaccination. It is important to realize that many college students no longer have access to their primary care physician, and it may be difficult and daunting to start this process in a new place.

Some students are completely unaware that they can get vaccinated at their student health center. One study found that almost half of the college students sampled didn't know that they could go to their health center or even local community clinic to get the HPV vaccine(Kellogg et al., 2019). This is an issue of access that can be easily fixed.

Calculation

Calculation involves the amount of time one spends searching for information about a vaccine and weighing the pros and cons of vaccination. Sometimes too much time searching, especially when looking at the wrong sources, can negatively influence an individual to not vaccinate. Information sources are important. Oftentimes sources contain misinformation. Reliable sources for HPV and the HPV vaccine would include the CDC website, the World Health Organization website, and the American Cancer Society website, among others. Social media and blogs, which are popular to browse, often provide incorrect information.

One study found that college males most frequently got information about HPV from commercials and advertisements, their friends, news programs, and educational programs(Katz et al., 2011). While some of these sources have the potential to provide accurate non-biased information, some of these sources may perpetuate misinformation if one spends too much time engaging.

Collective Responsibility

A potential reason for vaccinating is to prevent oneself from spreading the disease to others. In the study about male beliefs, several males discussed the idea that if more males vaccinated against HPV, it would help others stay safe against the disease. They were hopeful in the fact that if more people were aware, maybe one day HPV would no longer be a problem(Pitts et al., 2017). This is the idea behind herd immunity. Eventually, through vaccination or prior exposure, a high percentage of the population is immune to a particular disease. Certain members of the population may be unable to be vaccinated, such as pregnant women or newborns, and must rely on others to get vaccinated to be protected against a disease by herd immunity. This is a perfect example of collective responsibility(APIC, 2020). Collective responsibility can work in the opposite way too, however. Sometimes instead of wishing to vaccinate oneself for the benefit of others, individuals expect others to take on the burden of vaccination. For example, one study found that college students preferred their partners to be vaccinated even when they themselves were not(LaJoie et al., 2018).

Differences Between Men and Women

Women often have a higher intention to vaccinate, and higher actual uptake rates compared to men. This is seen in the national data on rates of HPV vaccination uptake. This could be due to several factors. Men have lower awareness and knowledge of HPV. Due to a lack of targeted HPV information to men, men often consider HPV as a women's issue and are not aware that it can affect them! They believe that the vaccine is only for women(Pitts et al., 2017).

One study found key differences between the motivations and psychological traits of men and women in their sample. Women who had been vaccinated reported higher interest in and ability to understand health-related information compared to unvaccinated women. For men that had been vaccinated, their motivations included less need to deliberate and a greater need to manage threat and uncertainty as compared to unvaccinated men. However, this study did find that regardless of gender, a greater health-related information interest and understanding as well as a need to manage uncertainty and risk were the primary motives associated with an increased intention to get the vaccine. Decreased vaccination intentions were associated with a greater need to deliberate, which speaks to the calculation component of the 5C Model(Scherer et al., 2018).

Focusing on the College Aged Population

Barriers faced by adolescents are different than those faced by young adults aged 18 to 26. After turning 18, the choice to vaccinate is not required to be a joint decision between parent and child. For those that never received the HPV vaccine or failed to complete the series, turning 18 can be viewed as an opportunity to catch-up, with or without parental consent.

In the study by Barnard et al., they found that the majority of unvaccinated undergraduate students were in the early stages of vaccination decision-making. There is an opportunity to assist undergraduate students within the catch-up period to make the decision to get the HPV vaccine(Barnard et al., 2017).

Table 2.3. Barriers to the HPV vaccine for the 18-26 year old population

Barriers	**Details**	**Citations**
Doubt		
Safety concerns	Even in those previously vaccinated, safety was still a concern	Rambout et al. (2014), LaJoie et al. (2018)
Doubt	Over effectiveness of a newer vaccine	Hirth et al. (2018)
Lack of a mandate	Specifically, lack of mandate for vaccine for college	Pierre-Victor et al. (2018)
Questioning policy makers	Males questioned why it had been withheld from them for years; government conspiracy theories	Pitts et al. (2017)
Generally vaccine hesitant	Dislike needles, whole process	Hirth et al. (2018), Pierre-Victor et al. (2018)
Decision making process		
Lack of provider recommendation	Individuals who receive a provider recommendation are more likely to receive the vaccine	Pierre-Victor et al. (2018)
Lack of parent/guardian shared decision making	Those college students that stated that a parent or guardian had helped them make the decision about vaccination were more often vaccinated than not	LaJoie et al. (2018)
Stage of decision making	Many undergrads are still in the early stages of vaccination decision making	Barnard et al. (2017)
Stigma	Opinions of friends, parents are influential	Hirth et al. (2018)
Personal Characteristics		
Relationship status	Don't need if NOT sexually active	Pierre-Victor et al. (2018)
Relationship status	If in a relationship--not at risk	Thompson et al. (2019)
Religion	Highly religious undergraduates had lower levels of HPV knowledge, vaccination, and compliance	Birmingham et al. (2019)
Low perception of risk	Including the feeling that the consequences of getting HPV wouldn't be that severe	Barnard et al. (2017), Pitts et al. (2017)
Not being future oriented	Feeling healthy in the present and not prioritizing future health	Betsch et al. (2018), Hirth

		2018
Collective Responsibility	Some feel that if they get vaccinated, it will protect others from HPV…but this can go the other way where some prefer that their partners are vaccinated even when they themselves are not	Pitts et al. (2017), LaJoie et al. (2018)
Education		
Lack of Information/ Misinformation	Lack of complete knowledge on HPV & consequences, unaware of age recommendations or number of required doses	Hirth et al. (2018), Kellogg et al. (2019), Pitts et al. (2017), Albright & Allen (2018), Katz et al. (2011)
Access		
Cost	Cost of vaccination; unsure if covered by insurance	Rambout et al. (2014)
Access	Can include access to doctor, time constraints, feeling that they would forget an appt, or even not knowing where to get the vaccine	Pitts et al. (2017), Hirth et al. (2018), Kellogg et al. (2019)

Interventions Used to Increase Uptake

Despite research on barriers and facilitators of HPV vaccine uptake, there is a lack of evidence on which interventions are most effective in achieving the desired level of vaccination. This section will look at some of the measures used to try to increase HPV vaccination rates in adults aged 18 to 26 years old.

Educational Measures

Acceptability of the vaccine is often one of the first steps in convincing an individual to get that vaccine. A randomized controlled trial looked at the effects of educational interventions on HPV vaccine acceptability(Cory et al., 2019). 256 women between the ages of 12 and 26 years old were randomized to one of three study arms: control, educational handout, or educational video. 51.7% of participants in the

educational video arm reported willingness to accept the vaccine. Only 33.3% of those in the educational arm and only 28.2% of those in the control arm reported willingness to accept the vaccine. Median HPV vaccine knowledge scores were higher in the educational video and handout arms compared to the control. It was also found that the educational video was more likely to be helpful in deciding on vaccination.

While this study did not measure intention to vaccinate or actual completion of vaccination, its results show that targeted educational interventions can increase HPV vaccine acceptability and knowledge among young women. It is possible that targeted educational measures could increase rates of HPV vaccine intention and uptake.

Mandates

Within a year of the first vaccine, Gardasil, being licensed for use in 2006, a total of 41 states had proposed strategies to increase uptake, including educational campaigns, public subsidies, and insurance-coverage requirements(Colgrove et al., 2010). In 24 states, bills to make HPV vaccination a requirement were introduced. Over the next two years, however, policymakers began to distance themselves from the idea of making an HPV vaccine mandate for schools.

Mandate proposals for this vaccine are controversial because they involve adolescents and the subject of sexuality(Keim-Malpass et al., 2017). A very interesting study conducted by Colgrove et al, examined barriers impeding the adoption of HPV vaccination mandates from the perspective of key informants in six geographically and politically different states. There were several themes that led legislators and advocates to be against a potential mandate in the early years following the approval of Gardasil: newness of the vaccine, sexually transmitted nature of HPV, non transmissibility of HPV

in the classroom setting, discomfort with the vaccine manufacturer's involvement, and price of the vaccine.

As of July 2020, five jurisdictions, Rhode Island, Virginia, Washington D.C., Hawaii and Puerto Rico, have successfully passed legislation mandating the HPV vaccine as a requirement for school attendance. Some states have advocated for HPV vaccine over the years in other ways, such as providing the vaccine at no cost (New Hampshire). Texas was the first state to issue a mandate, but it was later overridden. Legislation within this area is ever changing (Skinner, 2020).

Technology

A systematic review looking at the use of communication technologies to improve HPV vaccination initiation and completion found that use of technology-based communication usually resulted in higher rates of vaccine initiation and completion compared to control(Francis et al., 2017). Twelve randomized controlled trials were included, with a total of 38,945 participants, male and female, between the ages of 10.5 and 26 years old.

Interventions targeted parents, patients, or healthcare providers. All but one study was conducted within a healthcare setting. Interventions were delivered in various ways, including recall/reminder prompts within the electronic health record, text messages, interactive computer videos, automated telephone calls, and email. Control conditions included mailed letters, general immunization brochure, text-based non-HPV information, computer-based non-HPV information, no-treatment control, and standard of care.

For the interventions targeting patients only, two studies used an interactive computer video technology, and one used a mix of methods, including automated calls and text messages. The two studies that included interactive computer video interventions found higher vaccination outcomes on at least one outcome, and both studies had statistically significant results. For example, in one of these computer video studies, 67% of patients in the intervention group received the second HPV vaccine dose compared with only 25% of the patients in the control group. However, the study involving text messages and calls found that although not statistically significant, the percentage of control group patients up to date on their vaccination was 2% higher than the intervention group.

This leads us to one of the main themes that appears within intervention studies involving the HPV vaccine. There is a lack of consistency. Sometimes interventions will work in a select group of participants—but a similarly designed study in a different group may not work at all.

Financial Incentives

Financial incentives have been used in many ways to improve health outcomes—from encouraging healthy behaviors to preventative screenings. An interesting study tried using financial incentives to increase HPV vaccination rates in girls between the ages of 16 and 18 years old in England. While we are focusing on the 18-26 year old population, the U.K. “catch-up” period falls a little sooner compared to the US and targets those that are 17 or 18 years old. The study also included text message reminders for the second and third dose. The vouchers were worth $73 and could be redeemed at various shops. They found that uptake of the first and third vaccine increased by 10% in the financial

incentive group. While this study did show that financial incentives can improve uptake, the authors brought up the fact that because the rates did not increase dramatically, this is not cost-effective(Mantzari et al., 2015).

Message Framing

Kahneman and Tversky (1981) found that by framing the same problem in different ways, people would often change their answer. People are expected to be rational decision makers, but these contradictory decisions are the result of different attitudes when a decision choice is framed as a gain or a loss. People tend to be risk averse in response to gains and risk seeking in response to losses. For example, when presented with a hypothetical scenario with an option of saving 200 lives with Program A or having a 2/3 probability that no people will be saved with Program B, the majority of respondents chose Program A, the risk averse choice in response to a gain of 200 lives. In another hypothetical scenario, Program C was presented as ensuring that 400 people would die, while Program D was presented as having a 2/3 probability that 600 people would die. The majority of respondents chose Program D, which represented a risk seeking choice in terms of loss.

Message framing has been used in public health to encourage healthy behaviors. Gain and loss framed messages have often been evaluated within the healthcare space. However, there have been mixed results on effectiveness. For example, one study found that women who viewed a loss-framed message emphasizing the risks of not obtaining a mammography were more likely to have obtained a mammography within 12 months of the study, compared with the women who viewed a loss framed message emphasizing the benefits of mammography(Banks et al.,1995). Another study looked at the effect of loss

and gain framed messages on sunscreen use. They found that those who received a gain framed message were more likely to request sunscreen and intend to use it(Detweiler et al., 1999.).

We know that message framing in terms of gains and losses (goal framing) can improve health-related intentions and outcomes, but there is no standard rule saying whether gain framed, or loss framed messaging works most effectively. It depends on the context. In a systematic review on message framing within vaccine communications, it was found that effectiveness of the gain or loss framed message often depended on the characteristics of the message recipient, their perceived risk of getting the disease or illness, and situational factors. The effects of message framing were found to be inconsistent. There is a need for more studies(Penţa & Băban, 2018).

When looking at the HPV vaccine for the 18-26 year old population, message framing has potential. In a systematic review done by Godwin et al., message framing interventions to increase HPV vaccination intention or uptake included a variety of messaging strategies. A few examples include gain and loss messages, framing HPV as an STI, narrative messages, and tailored messages.

The studies that tested gain versus loss framed messages found that loss framed messages were often more successful but only when individuals possessed certain characteristics, such as being avoidance-oriented or having sex frequently without using a condom and/or having multiple sexual partners (risky behaviors)(Gerend & Shepherd, 2007b; Nan, 2012a).

From this systematic review, it seems that individual characteristics play a role in a messaging intervention's effectiveness. Combined messaging was also often found to

be effective in increasing intention to vaccinate. For example, in a study by Vorpahl et al., they found that STI framing and external attribution framing together increased intention to get the vaccine(Vorpahl & Yang, 2018). Another example involved the use of narrative messages that were either survival or death focused and incorporated barriers within the narrative message. It was found that survival stories addressing a social barrier demonstrated the greatest potential to increase women's intentions to vaccinate for HPV(Krakow et al., 2017).

Another unique way to frame messages is to highlight the social consequences of a negative health outcome. For example, when looking at smoking, a negative health outcome could be oral cancer and a social consequence of this health outcome could be feeling unattractive or anything that threatens your social life. Murdock et al. (2017) found that by highlighting the social consequences of a negative health outcome, people viewed the outcome as more temporally proximate and felt more vulnerable to it. This could be a promising way to frame messaging within the HPV vaccination space.

More research is needed to determine the effectiveness of messaging interventions on HPV intention and actual uptake within the 18-26 year old population. Messaging effectiveness was often dependent on the individual's characteristics and behavior. Tailored messages, targeted to patient-specific characteristics, may be more successful in improving vaccination rates.

Table 2.4. Messaging Interventions

Message Type	Study Design	Sample and sample size	Intervention effects	Author (Year)
Gain vs. Loss	2 Intervention Groups	Females, N=121	A loss-framed message led to greater HPV vaccination intentions but only among participants who had multiple sexual partners.	Gerend & Shepherd (2007)
	2x2 Between Subjects	Females, N=237	The loss-framed message led to greater vaccination intentions but only among participants in the one-shot condition.	Gerend et al. (2008)
	2x2 Design	Males & Females, N=108	There were no significant effects of loss-framed messages on intention.	Park (2012)
	2 Intervention Groups	Males & Females, N=383	Advantage for loss-framed messages and intentions were found to be more favorable among future-minded individuals.	Nan (2012b)
	2 Intervention Groups	Males & Females, N=229	Loss-framed messages were more persuasive for avoidance-oriented individuals, and both frames are equally effective for approach-oriented individuals.	Nan (2012a)
	2x2 Design	Males & Females, N=142	Loss-framed messages were most effective but only when posted on Facebook (vs. online newspaper).	Lee & Cho (2017)
	2x2 Design	Males & Females, N=108	No significant effects of the loss-frame message on intention.	Park (2012)
	2x2x2 Design	Females, N=286	There was weak evidence that supplementing high-risk information with loss-framed messages and low-risk information with gain-framed messages would affect women's coping appraisal and motivation/intention to get vaccinated.	Gainforth & Latimer (2011)
Time Orientation	2 Intervention Groups	Males & Females, N=416	Individuals with high CFC usually were more persuaded by the present-oriented messages, compared to the future-	Kim & Nan (2016)

			oriented messages.	
	2x2 Design	Males & Females, N=416	For intentions to get the HPV vaccine when offered free of cost, the present-oriented (vs. future-oriented) message led to stronger intentions, although not statistically significant.	Kim & Nan (2019)
	2x3 Factorial	Males & Females, N=360	Thinking about one's future and reading loss-framed message were both effective in producing stronger anticipated regret, which led to greater intentions.	Kim (2020)
	2x2x2 Design	Males & Females, N=156	Among participants who had no prior knowledge of HPV vaccine, the gain-present and loss-future framed messages resulted in greater intentions.	Wen & Shen (2016)
Tailored	2 Intervention Groups	Females, N=193	Women with no sexual experience intended to receive an HPV vaccine more in the tailored condition than the detailed condition.	Baxter & Barata (2011)
	2 Intervention Groups	Females, N=94	Participants in the tailored condition (barriers) reported greater increases in intentions than did participants in the nontailored condition.	Gerend et al. (2013)
Framing HPV as STI vs Cancer	2x2 Design	Males & Females, N=272	STI framing and external attribution framing together increased participants' intentions to get the vaccine.	Vorpahl & Yang (2018)
Fear vs. Hybrid	2 Intervention Groups	Males & Females, N=407	There was no effect of message condition (fear vs. hybrid) on intention. Intentions were strongest when guilt and personal responsibility were high.	Carcioppolo et al. (2017)
Norms	Between subjects	Males & Females, N=190	Those in the injunctive norm condition had the highest intention to get vaccinated, but with no main effect found.	Xiao & Borah (2020)
Survival vs. Death Narratives	2x2 Factorial Design	Females, N=247	Survival stories addressing a social barrier demonstrated the greatest potential to increase women's intentions.	Krakow et al. (2017)
Narratives	5 Intervention Groups	Males & Females, N=174	Both evidence type and narrative type had an indirect effect on intention to get the HPV vaccine free of cost	Nan et al. (2015)

			(through HPV risk perception).	
	2 Intervention Groups	Males & Females, N=222	Didactic messages (vs. narrative) produced greater anticipated inaction regret, which further influenced HPV vaccination attitudes and behaviors.	Kim (2020)
Vulnerability, Severity, Threat Levels	2x2 Design	Males & Females, N=278	A high vulnerability message paired with a high severity message created the greatest increase in feelings of vulnerability and severity related to HPV which increased intentions.	Richards (2015)
	Between Subjects, 12 Messages	Females, N=442	A 1-to-1 ratio of threat to efficacy was most effective at increasing intentions. Framing HPV as preventing genital warts led to greater intentions versus framing as preventing cervical cancer.	Carcioppolo et al. (2013)

Theory

People make decisions based on many beliefs, attitudes, and risk perceptions. In this study, interviews were conducted with individuals between the ages of 18 and 26 to elicit knowledge levels, attitudes, and beliefs about HPV, the HPV vaccine, and vaccination in general. Barriers and facilitators were discussed, to have an updated baseline for this present study. In addition to these topics, health-decision making processes were explored. These interviews helped to get an idea of the potential segments within this population, which the survey formally defined later based upon various factors. After the interviews were complete, targeted promotional messages were developed based upon results of the qualitative analysis and current literature. To develop effective messaging, it is important to use key theories related to health decision-making and behavior change. In this section, we will discuss the Health Belief Model and the Theory of Planned Behavior, both of which have been successful in predicting and explaining health-related behaviors.

Health Belief Model

The Health Belief Model was developed in the 1950s and focuses on six constructs said to influence behavior: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy, and cues to action. Within the context of receiving the HPV vaccine, individuals are more likely to receive the vaccine if they feel they are especially susceptible to getting an HPV infection. They are also more likely to get the vaccine if they feel that the consequences of getting an HPV infection are severe. Individuals weigh the potential benefits of the behavior, in our example, the HPV vaccine, to see if the behavior of receiving the vaccine is worth it.

Perceived barriers to getting the vaccine are evaluated. Self-efficacy is an important piece to all of this and focuses on the individual and whether they feel they can actually go through with the behavior. Cues to action are motivators or reminders to complete the behavior and could be ads on television or a doctor encouraging you at a visit to get the vaccine. All of these constructs work together to encourage an individual to complete a health-related behavior or not (Rosenstock et al., 1988).

Theory of Planned Behavior

The Theory of Planned Behavior states that intentions to perform behavior can be predicted from attitudes, subjective norms, and perceived behavioral control. Both perceived behavioral control and behavioral intentions together can predict behavior under this theory, with the idea that intentions are the precursor to behavior.(Ajzen 1991, Rimer & Glanz, 2005)

Attitudes include the beliefs an individual has about the behavior as well as the beliefs about the outcomes related to the behavior. Subjective norms refer to what others in the individual's social group will think about the behavior in question and the individual's motivation to comply with these perceived norms. Perceived behavioral control involves control beliefs and perceived power. Control beliefs refer to those factors that an individual thinks may make it difficult to complete the behavior. Perceived power refers to the amount of power an individual has over completing the behavior. All of these constructs, attitudes, subjective norms, and perceived behavioral control, along with intention, help to predict an individual's motivation to complete the behavior. If an individual intends to do something, this is a good start. While intention does not entirely

predict action, it accounts for 30-40% of the variance in actual behavior.(Ajzen 1991, Faries, 2016)

An interesting study by Gerend et al., looked at the effect of message framing on HPV vaccination uptake. This study also compared the Health Belief Model and Theory of Planned Behavior theory to see which was most successful at predicting vaccination. While message framing was found to have no effect on vaccination uptake, they did find that both the Health Belief Model and the Theory of Planned Behavior were successful at predicting vaccination, with the Theory of Planned Behavior the best predictor out of the two (Gerend & Shepherd, 2012). While the Theory of Planned Behavior is the better predictor of actual behavior change, the Health Belief Model has been used in numerous studies to describe and predict behavior so was included as well. Using both allowed for a more comprehensive analysis of HPV vaccine decision-making.

CHAPTER 3

METHODS

The specific aims of this dissertation are to 1) identify barriers and facilitators of HPV vaccine uptake in the 18-26 year old population, 2) use a marketing approach to segment this population based on preferences and beliefs about the HPV vaccine and 3) test developed promotional messaging to determine which messaging is effective in increasing vaccine intention rates.

Research Questions & Hypotheses:

The overall goal of this dissertation is to define the segments that exist within the 18-26 year old population and develop targeted promotional HPV vaccination messages aimed at increasing intention to vaccinate. Increasing intention within this population is the main goal of this study.

Research Questions:

Aim 1 Research Questions:

RQ1. What are the barriers and facilitators of HPV vaccination uptake in the 18-26 year old population?

RQ2. What health behavior theory constructs are present in 18-26 year old's' decision making about the HPV vaccine?

Aim 2 Research Questions:

RQ3: Which factors predict HPV vaccination uptake?

Hypothesis: Factors including knowledge, attitudes, subjective norms, perceived susceptibility, perceived severity, and perceived barriers will predict HPV vaccination uptake.

RQ4: Which factors predict HPV vaccination intention?

Hypothesis: Factors including knowledge, attitudes, subjective norms, perceived behavioral control, perceived susceptibility, perceived severity, and perceived barriers will predict HPV vaccination intention.

RQ5: Do theory constructs such as attitudes and perceived susceptibility differ based upon vaccination status?

Hypothesis: 18-26 year old's HPV vaccine knowledge, attitudes, subjective norms, perceived susceptibility, and perceived severity, will differ based upon vaccination status.

RQ6. Which segments exist within the 18-26 year old population that may predict HPV vaccination intention?

Hypothesis: 4-5 unique segments will be identified within this population.

Based upon the current literature, it is likely that there are 4-5 segments that exist within this population. The key barriers faced by this population include lack of knowledge or misinformation, a low risk perception of HPV and HPV-related issues, a need for help when making health-related decisions, and hesitancy towards vaccines in general or the HPV vaccine specifically.

Aim 3 Research Questions:

RQ7: Which messaging strategies are effective in increasing HPV vaccination intention?

Hypothesis: Each segment will have its own message preference and respond differently to a message when compared to another segment.

RQ8: What preferences do 18-26 year old's have for HPV vaccine message delivery?

Hypothesis: Messages attributed to healthcare providers will be perceived as more trustworthy than those attributed to friends, family, or celebrities.

Segmentation will allow us to define the segments that exist within this population. It is expected that this will result in a distinct number of segments that differ on key characteristics which influence adoption and compliance with the vaccine. Each segment will contain individuals that share similar beliefs and attitudes. Having this knowledge will allow us to tailor messages for each segment in the future, resulting in each individual receiving a message that is most effective for them.

Study Design (Overview):

This study employed a mixed-methods design to answer the research questions listed above. This study was divided into three aims. The first aim used qualitative interviews to elicit barriers and facilitators of HPV vaccination uptake within the 18-26 year old population. This aim identified potential existing segments and finalized the segmenting variables used in the cross-sectional survey. The second aim used a survey to identify and define the segments that exist within this population, as well as each segment's characteristics and unique preferences. In the third aim, the targeted promotional messages were tested for effectiveness in increasing intention. Intention to

vaccinate was measured before and after exposure to one of the developed messages or the control message. This was a between and within subjects design.

Aim I: Qualitative Study

Aim 1: To identify barriers and facilitators of HPV vaccine uptake in the 18-26 year old population. This phase was accomplished through qualitative interviews of both males and females within this age group to understand the barriers and facilitators of HPV vaccine uptake and compliance.

Research Design, Participants, and Setting

Semi-structured, qualitative interviews conducted over Zoom with participants between the ages of 18-26 were conducted. The interview script contained open-ended questions designed to elicit knowledge and perceptions of HPV and the HPV vaccine, and barriers and facilitators of the HPV vaccine. This study included a purposive sampling of 21 participants. Sample size is difficult to calculate for qualitative research, but studies have shown that a number between 20 and 30 is often enough to reach saturation, depending on the characteristics of the study population and research topic.(Bronde, 2013) For this study, saturation was determined to be the point at which no new information was being gained from additional interviews. After conducting 19 interviews, it was believed that saturation was reached. Two additional interviews were conducted to confirm saturation. Participants included those who had never received the vaccine, partially completed the vaccine series, and those that had completed the vaccine series. Additionally, interview participants were selected to have maximal variation in terms of sex, HPV vaccination status, socioeconomic status, race/ethnicity, and age. Participants were recruited through emails sent by professors at USC, posting of flyers in

the Coker Life Sciences building, Darla Moore School of Business, and local businesses. After completion of the interview, participants received a $15 Amazon e-gift card.

Interview Participants

The goal of these interviews was to elicit both the barriers and facilitators of HPV vaccination uptake. Depending on the age when started, an individual needs two to three doses of the HPV vaccine in order to be fully protected. This creates three types of individuals: those that have received all recommended doses of the HPV vaccine, those that have received a partial amount of HPV vaccine doses, and those that have received no HPV vaccine doses. It is essential to understand the barriers and facilitators of HPV vaccination in all three of these contexts. All three of these types of individuals were recruited for the interview in order to fully understand the viewpoints of all three situations.

Interview Process and Script Development

The semi-structured interviews of approximately 30 minutes in length contained open-ended questions to elicit participants' views, beliefs, perceptions, and barriers or facilitators related to the HPV vaccine. The interview script was guided by the current literature on barriers and facilitators of the HPV vaccine as well as theory. Both the Theory of Planned Behavior and Health Belief Model constructs were used to guide interview questions. While the Theory of Planned Behavior has often been cited as more accurate in predicting HPV vaccination, the Health Belief Model is a tried and true way to predict and understand behavior, including HPV vaccination. Both were used to understand the full view of the individual (Please see **Appendix A** for the interview script).

After development, the interview script was pre-tested for content validity among 5 students at USC. A think-aloud process was used to understand the thought process of the interviewee(Padilla & Leighton, 2017). If questions were confusing, this provided an opportunity to alter the questions to meet the needs of the interviewees before the actual interviews began. This also allowed questions to be added that may have been missing from the script.

All interviews were audio-recorded and transcribed verbatim. Interviews were de-identified and coded so that patient confidentiality was protected. Data analysis was conducted simultaneously with data collection to identify the point of saturation. As stated above, it was expected that this would most likely occur at a point between 20 and 30 participants. A combination of inductive and deductive coding was used during analysis. A pre-developed set of codes based upon the current literature relating to HPV vaccination barriers was used to deductively code the data. Since theory was also used in the development of this interview script, the constructs of the two theories assisted with coding of the data. However, as new, unexpected themes were identified, these were added to the coding scheme. AG coded all transcripts independently while a second researcher, ES, coded 50% of the transcripts independently. The ten transcripts that were coded by both AG and ES were analyzed for inter-rater reliability. Any discrepancies were resolved via discourse and consensus. Cohen's kappa was used to ensure inter-rater reliability with a value of 0.70 or above considered acceptable. All qualitative data analysis was conducted using NVivo qualitative analysis software version 12. Through these interviews, barriers and facilitators of the HPV vaccine as viewed by the 18-26 year old population were identified as well as a general idea of potential segments within this

population. Preferred messaging strategies of this age group were also revealed through the interview process, which helped inform Aim 2. These interviews helped to further develop the survey used in Aim 3.

Table 3.1 Constructs Mapped to Example Interview Questions

Domain	HBM/TPB Construct	Example Questions
Health Behaviors		• How frequently do you go to the doctor? • What causes you to go to the doctor? • How you manage your overall health?
Relationship Status		• Are you currently in a relationship? • Are you sexually active?
HPV Knowledge		• What do you know about HPV? What are your thoughts on HPV? • How did you learn about it? (where did they get information) • What do you know about the HPV vaccine?
Health Belief Model	Perceived Susceptibility/Risk Perceptions	• Do you feel like you are at risk? Why or why not? • Do you feel that others are more or less at risk for contracting the HPV virus/infection? Why? • What do you think the chance is that HPV turns cancer?
Health Belief Model	Perceived Severity	• What do you think the chance is that HPV turns cancer? • What can people do to prevent HPV and HPV-related cancer?
Health Belief Model/Theory of Planned Behavior	Perceived Benefits/Attitudes	• When you were thinking about getting this vaccine, what did you think were the benefits of getting the vaccine?
Health Belief Model/Theory of Planned Behavior	Perceived Barriers/Perceived Behavioral Control	• Were there any barriers to getting the vaccine? • Insurance, cost issues, scheduling… • If you could change one thing about the HPV vaccine and the process for getting it, what would it be?
Health Belief Model/Theory of Planned Behavior	Cues to Action/Subjective Norms	• You said you had gotten the HPV vaccine. Was this vaccine recommended to you? • Tell me more about what made you initially get this vaccine? ○ Whose decision was it?

		○ What role did parents/friends/others in decision making process? ○ Did you go to the doctor to request it? OR did doctor (or other healthcare professional) recommend it? • Looking back, what would have encouraged you even more to get the vaccine? For example, what would have swayed you to get the vaccine in addition to the factors that made you get it in the first place? ○ Endorsement by an MD? Celebrity? Friend? ○ More information? What kind of information? ○ Specific messaging? If the process was easier?

Interview Screener

To ensure maximal variation in terms of sex, age, race/ethnicity, and HPV vaccination status, potential participants were required to fill out a screening questionnaire prior to scheduling an interview. This screener was linked to the recruitment emails and ads in the form of a QR code and a shortened bit.ly link. After completing the screener, eligible participants were emailed a Calendly link to sign up for an interview date/time.

Table 3.2 Interview Screener

Domain	**Questions**	**Possible Answers**
Awareness	Have you heard of HPV?	Yes or No
HPV vaccination status	Have you gotten the HPV vaccine?	Yes, No, Not sure
	If yes, how many shots/doses have you received?	One, Two, Three, Not sure
Demographics	How old are you?	Open-ended
	What is your gender?	Male, Female, Prefer not to answer
	What is your race?	African American, American Indian or Alaskan Native, Asian, Caucasian/White, Native Hawaiian or Pacific Islander, Other
	What is your ethnicity?	Hispanic or Latino, Non-Hispanic or Latino
	What is your major/degree program here at USC?	Business, Science, Art, Public Health, English, Pre-med/pre-pharmacy or current med/pharmacy student, other
Email	What is your email address where I can contact you about scheduling the interview if you meet eligibility requirements?	Open-ended

Data Analysis

All analysis of the qualitative interviews was completed using NVivo software Version 12. The Theory of Planned Behavior and Health Belief Model constructs were used to deductively code the transcripts. All transcripts were coded initially by AG. A second researcher (ES) independently coded 50% of the transcripts. Following completion of all coding and finalization of the codebook, AG and the second coder met to code an example transcript together. The coding was led by ES and any questions or discrepancies were discussed via discourse and consensus. Following this session, ES coded 10 transcripts independently. AG compiled a total of 2,801 codes with 21 transcripts. ES compiled a total of 400 codes with 10 transcripts. Upon completion of coding, an adapted version of the Consolidated Framework for Implementation Research (CFIR) Rating Rules was applied to the coded data to identify the key constructs with the most influence on intention to vaccinate for HPV. Ratings were based upon both strength and valence of the coded constructs. Valence refers to whether the construct has a positive or negative influence on intention to vaccinate. Valence was identified as a barrier, facilitator, or neutral. Strength of the coded construct refers to the level of influence it has over intention to vaccinate. In this case, strength was classified as either weak or strong. A summary rating of both valence and strength was assigned to each construct (Keith et al., 2017). A mixed rating was applied to those codes that contained an equal number of comments describing it as a barrier and facilitator.

Aim II: Market Segmentation

Aim II: Market segmentation of this population based on preferences and beliefs about the HPV vaccine. A survey was used to define the segments within this

18-26 year old age group. The survey allowed us to understand the preferences and characteristics of each segment and understand which messaging strategies each segment prefers.

Market Segmentation

The use of marketing techniques within healthcare systems has increased over the years, allowing healthcare providers to create, communicate, and provide value to their particular area (Purcarea 2019). Understanding why patients fail to adhere to medications, practice healthy behaviors, or get a cancer-preventing vaccine through a marketing lens can add understanding and clarity. Oftentimes, multiple factors interact to explain patient behavior. When applied to the HPV vaccination, there are many different reasons one can think of as potential barriers to getting the vaccine. If this is the case, how do we figure out how to solve this? How do we figure out how to get all patients to accept HPV vaccination?

Market segmentation provides a solution for this dilemma that so many healthcare providers face. Market segmentation takes a look at the health issue and corresponding population and divides this population into smaller groups that share similar beliefs or characteristics. By dividing the market into smaller more homogenous groups, healthcare providers will be better able to target each segment separately and more effectively. Market segmentation solves the issue of using a one size fits all message to convince patients to comply with a certain health behavior.

We define a market based upon a “need” instead of a product. In this study, the “need” is to protect the 18-26 year old population from HPV infection and HPV-related cancers. When you think about the “products” that could be used to satisfy this need, an

individual could practice safe sex and use protection, a female individual could regularly get Pap smears to get routinely checked for infection and/or cancer, or an individual could get the HPV vaccine. The HPV vaccine is the "product" within this study.

Our goal is to increase HPV vaccination intention within the college-aged population. How do we do this? Based upon the literature, there are several barriers that exist for this population. Do we just pick one barrier and frame our messaging around it? This tact would be insufficient since we would be ignoring those individuals that face other barriers. Instead, we will conduct a market segmentation in order to define our segments first and then develop targeted messages for each segment. This should result in more individuals getting the HPV messaging that they need since the message they receive will be developed based upon which segment they belong to.

According to Schulman and Wood, marketing segmentation within the healthcare realm can be broken down into five steps (Schulman & Wood 2020). First, you must identify both the population of interest and the behavior you are trying to influence. Within this study, our population is those individuals between the ages of 18 and 26 that have not initiated or completed the HPV vaccine series. The behavior that we are trying to influence is intention to receive the HPV vaccine. The second step is to determine whether to investigate the motivators of compliance within your population or the deterrents of behavior. The third step involves using qualitative research methods to determine these motivators or deterrents.

The fourth step involves surveying your population of interest about these motivators and deterrents. Once the survey data is collected, the number of segments and size of these segments can be determined based upon the variables asked within the

survey. Often for segmentation studies, different variables are analyzed, and different numbers of segments are tested in order to determine what makes the most sense. Key demographic or psychographic characteristics can be correlated with different segments.

Once segments are defined and characterized, it is possible to develop segment-specific interventions (or messaging) that will be more effective compared to developing a one size fits all intervention (or message). This is target marketing and will often lead to higher success because of tailoring the intervention (or message) to the segment an individual belongs to.

Research Design, Participants, and Setting

Using the information gathered through qualitative interviews and the current literature on the subject, a national cross- sectional survey was developed to determine the number of segments within this population. This survey was used to define the segments and learn more about the characteristics of individuals in each segment, including knowledge level, attitudes, and perceptions related to HPV and the HPV vaccine. Pre-testing of the survey was conducted with 5 U of SC students. The think-aloud method was used to measure content validity of the survey. Revisions to the survey were made based on student feedback.

Survey Participants

The target population was 18-26 year old males and females within the US. To get a diverse and large sample size, a Qualtrics panel was utilized. Inclusion criteria included being between the age of 18 and 26 years old. The survey included those individuals who have a) never gotten the HPV vaccine, b) have started the HPV vaccine series but have yet to complete it, and c) have completed the HPV vaccine series. It was

essential to recruit both the participants that have started the series without completing it and those that have not begun the series yet. As of 2018, the percentage of adults aged 18-26 who received at least one dose of the series was 39.9%, while the percentage of adults not receiving any dose at all was 38.6%. These percentages make up a large market for the HPV vaccine. However, it is also important to include the small percentage of individuals who have completed the HPV vaccine series. Because of this, this group of individuals was limited to 100 of the total sample. The inclusion of this group provided valuable information on barriers and facilitators of uptake and built off of the information gained through the interviews in Aim 1. Participants were screened prior to taking the survey to ensure that each individual answered the questions that are specific to their HPV vaccination status.

Qualtrics Panels

Qualtrics is the one of the leading survey technology solutions and partners with over 20 online sample providers to supply a network of diverse and quality respondents. Qualtrics recruits the majority of its participants from traditional actively managed, double opt-in market research panels.[19] Participants can also be recruited through member referrals, website intercept recruitment, targeted email lists, gaming sites, customer loyalty web portals, permission-based networks, and social media. Participants are incentivized in various ways. Some earn SkyMiles for taking a survey. Others may earn points at their favorite store. Still others may earn cash or a gift card.

Qualtrics Data Quality Review

A soft launch of the survey was conducted by Qualtrics to check for any problems within the survey prior to the full launch. A total of 50 responses were collected and

reviewed to ensure that quotas were in place and accurate. An attention check was added to ensure quality responses. Once 800 responses were collected, all responses were reviewed to ensure quality results. Any respondents that straight-lined or answered the open-ended questions with gibberish comments were removed. All response were checked to ensure they met eligibility criteria.

Sample Size Calculation

The target sample size was informed by the number of segments expected to be present as well as the number of segmenting variables used to define the segments, identified through the qualitative interviews in Aim 1. In market segmentation studies, sample size is calculated by multiplying 10-30 x # of survey questions.(Dolnicar -et al., 2016) It is important to have a large enough sample size to be able to capture the correct number of segments, especially if some segments are smaller than others. For this survey, the target sample size was estimated to be 500-750participants. The final sample size, informed by this estimation and cost considerations, was 780 participants. This included 122 participants who had completed all recommended doses of the vaccine, and the remaining 658 containing a mix of participants who had either not started the series or had partially completed the series.

Development of the Segmentation Survey

This survey was developed from the results of the interviews in Aim 1 as well as previously used survey items by Waller, et al. and Gerend, et al(Gerend, 2012; Waller et al., 2013). Waller developed a validated scale that measures general HPV knowledge and HPV vaccine knowledge. Knowledge, or lack of correct knowledge, is often cited as a barrier to HPV vaccination, so it is essential to include this within the segmentation

survey. Gerend developed both Health Belief Model and Theory of Planned Behavior informed survey questions which were re-used in this survey. Similar to the interview script, the inclusion of theory driven questions is important in predicting and explaining behavior.

Barriers to vaccination were a key section within this survey. This helped further determine what is preventing this population from getting vaccinated, in addition to knowledge, attitudes, and personal characteristics. At the end of the survey, participants were asked to view the created messages aimed at increasing intention to vaccinate that were developed in Aim 3 and were asked to rate the messages as effective or not.

Table 3.3 Constructs Mapped to Example Survey Items

Domain	**Construct**	**Example Questions**	**Citation**
Intention (for those that haven't started or completed HPV vaccine series)		In the next year… i. How likely is it that you'll try to get more information about the HPV vaccine? (1=very unlikely; 2=somewhat unlikely; 3=neither unlikely nor likely; 4=somewhat likely; 5=very likely) ii. How likely is it that you'll consider getting the HPV vaccine? (same as previous) iii. How likely is it that you'll try to get the HPV vaccine? (same as previous) iv. How likely is it that you'll actually get the HPV vaccine? (same as previous) vi. If a physician offered you the HPV vaccine in the next year, how likely is it that you'd get vaccinated? (same as previous)	Gerend, et al. (2012)
Personal Characteristics	Health Behaviors	Please respond to the following questions and state whether you strongly agree, agree, neither agree nor disagree, disagree, or strongly disagree: • I regularly go for medical check-ups • I'm not afraid to use non-traditional health care providers such as herbalists • I keep up with the latest scientific health information	Gould (1988)
	HPV Decision Making	Please respond to the following questions and state whether you strongly agree, agree, neither agree nor disagree, disagree, or strongly disagree: • I feel comfortable finding information about the HPV vaccine	

		• I feel comfortable asking my doctor or other healthcare professional about the HPV vaccine • I know where to go to get the HPV vaccine	
	Relationship Status	Are you in a relationship? Are you sexually active? 1. If YES, Do you use STI/STD protection (i.e., condoms)?	
Knowledge about HPV		Please answer true or false to the following questions based upon your knowledge: • HPV is very rare • HPV always has visible signs or symptoms • HPV can cause cancer	Waller, et al. (2013)
Knowledge about HPV vaccination		Please answer true or false to the following questions based upon your knowledge: • HPV vaccines require two to three doses • The HPV vaccines offers protection against all sexually transmitted infections • The HPV vaccines are most effective if given to people who have never had sex	Waller, et al. (2013)
Theory of Planned Behavior	Attitudes	Please respond to the following questions and state whether you strongly agree, agree, neither agree nor disagree, disagree, or strongly disagree: • Getting the HPV vaccine will help protect me from HPV infection • Getting the HPV vaccine will help protect me from developing HPV-related cancers. • Getting the HPV vaccine is the right thing to do for me.	Gerend, et al. (2012)
Theory of Planned	Subjective	Please respond to the following questions and state	Gerend, et al.

Behavior	Norms	whether you strongly agree, agree, neither agree nor disagree, disagree, or strongly disagree: • My parents feel that I should get the HPV vaccine. • I want to do what my parents feel is best. • My friends feel that I should get the HPV vaccine. • I want to do what my friends think is best. • Getting the HPV vaccine seems to be the popular thing to do among people my age. • I want to do what people my age are doing.	(2012)
Theory of Planned Behavior	Perceived Behavioral Control	Please respond to the following questions and state whether you strongly agree, agree, neither agree nor disagree, disagree, or strongly disagree: • I feel confident that I can ask my doctor (or other healthcare professional) about getting the HPV vaccine. • I feel confident that I can make an appointment to get the HPV vaccine. • I feel confident that I can get the HPV vaccine even if I don't like getting a shot. • I feel confident that I can get the HPV vaccine even if it means I need to get two or three doses.	Gerend, et al. (2012)
Health Belief Model	Perceived Susceptibility	Please respond to the following questions and state whether you strongly agree, agree, neither agree nor disagree, disagree, or strongly disagree: • If you don't get the HPV vaccine, how likely is it that you will get an HPV infection? (Genital warts? HPV-related cancer?) –very likely to very unlikely • If you don't get the HPV vaccine, what are your chances of getting an HPV infection? (Genital warts? HPV-related cancer?) –very large change to	Gerend, et al. (2012)

		very small chance If I don't get the HPV vaccine, I would feel vulnerable to getting an HPV infection? (Genital warts? HPV-related cancer?	
Health Belief Model	Perceived Severity	Please respond to the following questions and state whether you strongly agree, agree, neither agree nor disagree, disagree, or strongly disagree: • It would be very serious if I got an HPV infection. (Genital warts. HPV-related cancer) • If I got an HPV infection (Genital warts. HPV-related cancer), it would have major consequences. • If I got an HPV infection (Genital warts. HPV-related cancer), it would be devastating to me.	Gerend, et al. (2012)
Health Belief Model/ Theory of Planned Behavior	Barriers	Please indicate how much the following factors would prevent you from getting the HPV vaccine (strongly agree, agree, neither agree nor disagree, disagree, or strongly disagree): • Cost. • Scheduling. • The number of required shots. • Potential of side effects from the HPV vaccine.	Gerend, et al. (2012)
Hypothetical Messaging Strategies		Read the following hypothetical messages and indicate whether each message would encourage you to get the HPV vaccine or not. (Likert scale) • Control message • Facts-based • Murdock style messages • Personal story • Fear tactic	Merck (2020b), Cartmell et al. (2019), Kim (2020), Murdock et al. (2017)

		• Anticipated regret	
Trust		When thinking about the HPV vaccine, how much do you trust information coming from a: • Doctor • Pharmacist • Family member • CDC	Freimuth, et al. (2017)
Regulatory Focus		This set of questions asks you about specific events in your life. Please indicate your answer to each question by selecting the appropriate number. • Compared to most people, are you typically unable to get what you want out of life?	Higgins et al. (2001)

Variables

For those participants who either had not started or not completed the HPV vaccine series, intention to get the vaccine was identified using a scale developed by Gerend, et al. Intention was identified within the context of the next year, a) how likely is it that you'll try to get more information about the HPV vaccine, b) how likely is it that you'll consider getting the vaccine, c) how likely is it that you'll try to get the HPV vaccine, d) how likely is it that you'll actually get the HPV vaccine, and e) if a physician offered you the vaccine in the next year, how likely is it that you'd get vaccinated. Respondents were asked to rate their level of agreement with the statements from extremely unlikely to extremely likely. Each Likert-type item was scored, ranging from 1 for extremely unlikely to 5 for extremely likely. Mean scale scores were computed ranging from 1 to 5.

General HPV knowledge was included prior to asking about HPV knowledge using a validated scale. The purpose of this section was to gain a baseline understanding of what participants knew generally about HPV in relation to other STIs/STDs. Questions asked included "what is your likelihood of getting the following at some point in your life (HPV, Chlamydia, Gonorrhea, HIV/AIDS, Herpes, Cancer)?" Within this section, participants were asked about their comfort levels in finding information about HPV or the vaccine as well as whether they felt comfortable asking about their doctor about it. Open-ended questions asking about primary reasons for either getting or not getting the vaccine were included.

HPV knowledge and HPV vaccine knowledge were tested using a validated scale created by Waller, et al (2013). The HPV knowledge scale consists of 16 items with

answer options including yes, no, or don't know. Some example questions include a) HPV is very rare, b) HPV always has visible signs and symptoms, and c) There are many types of HPV. The HPV vaccination knowledge section consists of seven items and will be set up and scored the exact same way. Some example questions from this section include a) HPV vaccines require 2-3 doses, b) The HPV vaccines offer protection against all sexually transmitted infections, and c) The HPV vaccines offer protection against most HPV-related cancers. A few of the questions from Waller's HPV and HPV vaccination knowledge scales were updated to reflect current knowledge. For example, instead of focusing on the HPV vaccine preventing cervical cancer, additional items were added to include all HPV-related cancers. Correct responses were assigned one point and incorrect or "don't know" responses received zero points. All points were summed to create a knowledge summary score.

In this survey, personal characteristics including health behaviors, health-decision making, and relationship status were explored. Health behaviors included Gould's 9-item Health Consciousness Scale and other questions developed by Gould in his seminal paper (Gould 1998). Gould's health consciousness scale was included to understand differences between participants based upon health attitudes and beliefs. This is a validated nine item scale. Some questions include: I reflect about my health a lot, I'm very self-conscious about my health, and I'm aware of the state of my health as I go through the day. Answer options ranged from strongly agree to strongly disagree. Answers were scored and averaged from 1-5. Other questions from Gould not included in the final scale were included in this section for additional information related to health behaviors and attitudes. Relationship status was assessed with two base yes or no questions including a)

are you in a relationship, and b) are you sexually active. If yes was answered, more details were asked to assess the presence of risky behavior.

Attitudes were based upon the Theory of Planned Behavior in reference to the HPV vaccine. The 5-item scale used was borrowed from Gerend, et al. and includes a) getting the vaccine will help protect me from HPV infection, b) getting the HPV vaccine will help protect me from developing HPV-related cancers, c) getting the HPV vaccine is the right thing to do for me, d) getting the HPV vaccine is the right thing to do for others, and e) I believe there is a stigma related to the HPV vaccine. Each Likert-type item was scored, ranging from 1 for strongly disagree to 5 for strongly agree. Mean scale scores were computed ranging from 1 to 5.

Subjective norms were based upon the Theory of Planned Behavior in reference to the HPV vaccine. The 6-item scale used was borrowed from Gerend, et al. and includes a) my parents feel that I should get the HPV vaccine, b) I want to do what my parents feel is best, c) my friends feel that I should get the HPV vaccine, d) I want to do what my friends think is best, e) getting the HPV vaccine seems to be the popular thing to do among people my age, and f) I want to do what people my age are doing. Each Likert-type item was scored, ranging from 1 for strongly disagree to 5 for strongly agree. Mean scale scores were computed ranging from 1 to 5.

Perceived behavioral control was based upon the Theory of Planned Behavior in reference to the HPV vaccine. The 4-item scale used was borrowed from Gerend, et al. and includes a) I feel confident that I can ask my doctor or other healthcare professional about the HPV vaccine, b) I feel confident that I can make an appointment to get the HPV vaccine, c) I feel confident that I can get the HPV vaccine even if I don’t like getting a

shot, and d) I feel confident that I can get the HPV vaccine even if it means I need to get two or three doses . Each Likert-type item was scored, ranging from 1 for strongly disagree to 5 for strongly agree. Mean scale scores were computed ranging from 1 to 5.

This survey's section related to risk perception included perceived susceptibility and perceived severity, both of which were based upon the Theory of Planned Behavior in reference to HPV. The 3-item scale for perceived susceptibility used was borrowed from Gerend, et al. and includes a) If you don't get the HPV vaccine, how likely is it that you will get an HPV infection? (Genital warts? HPV-related cancer?), with response options ranging from very likely to very unlikely b) If you don't get the HPV vaccine, what are your chances of getting an HPV infection? (Genital warts? HPV-related cancer?), with response options ranging from very large change to very small chance, and c) If I don't get the HPV vaccine, I would feel vulnerable to getting an HPV infection? (Genital warts? HPV-related cancer?), with response options ranging from strongly disagree to strongly agree. Each Likert-type item was scored, ranging from 1 to 5. The 3-item scale used for perceived severity includes a) It would be very serious if I got an HPV infection. (Genital warts. HPV-related cancer), b) If I got an HPV infection (Genital warts. HPV-related cancer), it would have major consequences, and c) If I got an HPV infection (Genital warts. HPV-related cancer), it would be devastating to me. Response options ranged from strongly disagree to strongly agree and were scored, ranging from 1 to 5. Mean scale scores were computed ranging from 1 to 5.

Some barriers were borrowed from Gerend, et al. but additional barriers were added to create a more complete list. Respondents were asked to indicate how much the following factors would prevent them from getting the HPV vaccine: cost, scheduling,

the number of required shots, potential side effects from the HPV vaccine, concerns about the safety of the vaccine, concerns about the effectiveness of the vaccine, fear of what others may think, and mistrust of the vaccine. Response items ranged from strongly disagree to strongly agree. Mean scale scores were computed ranging from 1 to 5.

Potential messaging strategies were explored as part of this survey. This includes a list of potential sources about the HPV vaccine, such as tv ads, social media, and brochures, and asked participants to rate which source would most likely sway them to get the vaccine. It also explored recommendations and levels of trust from various sources. Within this section, all of the HPV vaccine promotional messages that were developed in Aim 2 were presented and participants were asked to indicate how much each message would encourage them to receive the vaccine. Response items ranged from extremely unlikely to extremely likely. Participants were also asked about levels of trust from various sources, following a style similar to what Freimuth used when assessing trust within the flu vaccination space (Freimuth 2017). Participants were asked to indicate how much they would trust information coming from different sources, ranging from 1 to 5. The last question was an open ended question asking about what participants would like to see within the HPV vaccine messaging space. This section was meant to get an idea of which messaging strategies will be most preferred by various segments.

Regulatory focus was assessed using an adapted version of the 11-item scale developed by Higgins to determine whether an individual is promotion focused or prevention focused (Higgins et al., 2001). Regulatory focus theory is a way of distinguishing between individuals that are more promotion focused versus individuals that are more prevention focused. According to Higgins, promotion focused individuals

are more focused on hopes and accomplishments (gains) and prevention focused individuals are more concerned with safety and responsibilities (non-losses). An example question is: Compared to most people, are you typically unable to get what you want out of life? Promotion focused versus prevention focused are each tallied based upon answers to specific questions within the scale. Overall regulatory focus is determined by subtracting the prevention score from the promotion score.

Segment Hypothesis

Based upon the literature review exploring barriers and facilitators of HPV vaccination, it was hypothesized that 4-5 segments exist within this population. There are four major barriers identified as potential segments: knowledge, risk perception, hesitancy, and decision-making process. Knowledge of HPV and the HPV vaccine is often lacking within this population. In fact, many individuals have complete misinformation regarding HPV and/or the HPV vaccine. This could potentially make up the biggest segment, at 35% of the population. Risk perception is often an issue. Many feel that they do not need the vaccine because they are not susceptible to getting the HPV virus. The reasoning behind this could be related to current relationship status or just optimism, but this segment could potentially be the second largest at 30% of the population.

The next proposed segment focused on the barrier of decision-making and refers to those individuals that rely on others to help them make decisions and potentially makes up 25% of the population. The HPV vaccine is recommended to be started early—at age 11 or 12. If a parent or guardian chooses not to vaccinate their child, the child still has an opportunity to get vaccinated once they turn 18 and can make their own decisions. But

what about those individuals who remain close with their parent even into adulthood? Maybe these individuals still rely on their parent's input about health-related issues, such as the HPV vaccine. This is just one example of what could be going on within this segment.

The last and smallest proposed segment makes up 10% of the population and focuses on hesitancy. This could include individuals who are hesitant about vaccines in general or just the HPV vaccine. Either way, they are unsure about getting this vaccine so choose to not get it.

The segments described above were an educated guess based upon the current literature—nothing is certain. The interviews provided a more solid idea of which segments existed within this population. The segmentation survey within Aim 3 was able to define the segments by measuring the barriers, knowledge, attitudes, and personal characteristics of the participants within the context of HPV and the HPV vaccine.

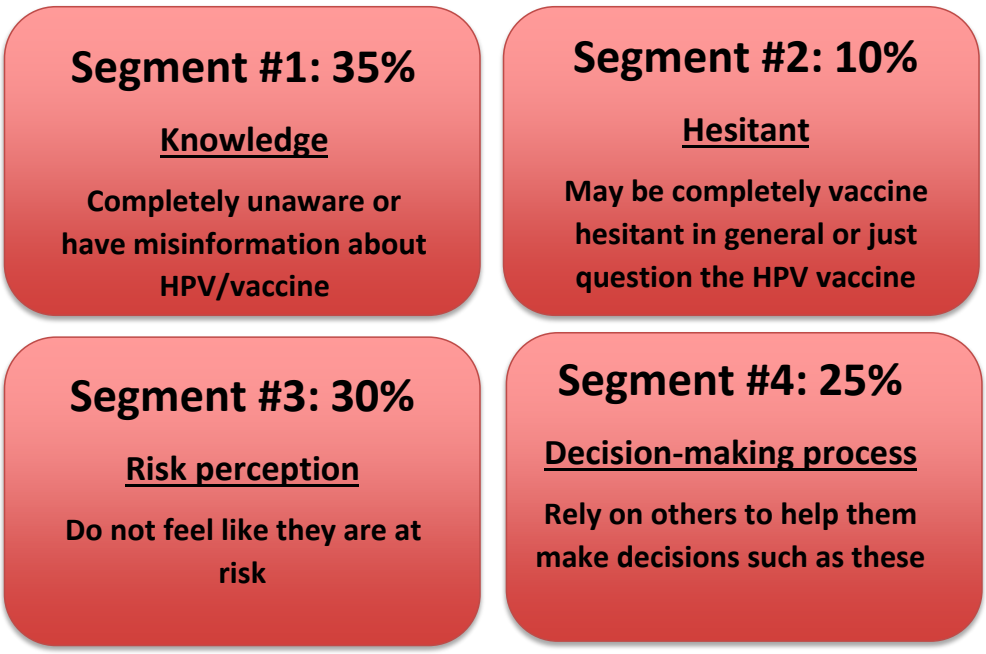

Figure 3.1 Possible Segments

Data Collection, Data Analyses, and Expected Findings

All analysis was done using SPSS version 25. Segmentation was determined using a Hierarchical Clustering approach, since there is no a priori information on the true number of segments existing within this population. Segmentation was based upon key segmenting variables collected in the survey, including knowledge level, attitudes, barriers, and personal characteristics in reference to HPV and the HPV vaccine. The exact segmenting variables used were determined after the interviews in Phase 1 were complete. When looking at the data from the survey, different numbers of segments were analyzed to determine which number makes the most sense. Once the number of segments were defined, descriptive statistics were used to define the characteristics and demographics of each segment.

This resulted in a distinct number of segments that differ on key characteristics which influence adoption and compliance with the vaccine. Having this knowledge will allow us to tailor messages for each segment, instead of creating one message that is supposed to influence all segments.

Exploratory Factor Analysis

It will be important to determine the relationship between variables after the data for the survey is collected. Factor analysis was conducted to determine if the multi-item scales used within the segmentation survey were measuring more than one latent construct. For example, in the survey, several constructs were measured—including attitudes, health behaviors, and risk perceptions. Factor analysis looks at the interrelationships between the variables and whether they are measuring what we think they are measuring. Another goal of factor analysis is to have the least number of

variables to explain and interpret results. This is accomplished using the principal components method of factor analysis and varimax rotation.(UCLA, 2020)

Aim III: Testing Targeted Messaging

Aim III: Test targeted promotional messaging to determine which messaging is effective in increasing HPV vaccine intention rates. Once the interviews were complete, targeted messages based upon participants' characteristics and preferences were developed and tested within the cross-sectional survey to determine which message(s) were effective in increasing HPV vaccine intention.

Message Development

These messages were designed by the characteristics and message preferences of participants identified in Aim 1 as well as the systematic review conducted by the PI on message framing used to increase HPV vaccination rates in the college-aged population. The systematic review focuses on framed messaging that has previously been shown to be effective in increasing intention or actual uptake of the HPV vaccine within the 18-26 year old population, such as combined messaging and the preference of loss versus gain framing. Messages were also informed by research done by Murdock et al. (2017) highlighting the social consequences of a health outcome within a message.

After the targeted messages were developed, they were tested to evaluate their effectiveness in increasing intention to vaccinate. Intention was measured on a 5-point Likert scale, with three questions asked including: a) How likely is it that you'll try to get more information about the HPV vaccine? (1=very unlikely; 2=somewhat unlikely; 3=neither unlikely nor likely; 4=somewhat likely; 5=very likely), b) How likely is it that you'll consider getting the HPV vaccine?, c) How likely is it that you'll try to get the HPV

vaccine? , d) How likely is it that you'll actually get the HPV vaccine?, and e) If a physician offered you the HPV vaccine in the next year, how likely is it that you'd get vaccinated? Mean scale scores will be computed ranging from 1 to 5.

The messages were tested in a pre-post design via the online survey used within Aim 3. Qualtrics was able to randomly assign participants to one of the targeted messages. Messages were tested across the segments, via a between subjects within subjects design.

Intervention

Due to the random assignment, each message was tested across all segments. Participants who have either never gotten the HPV vaccine or have only partially completed the series, were first asked about intentions to receive the HPV vaccine. After this, they were shown the message that they were randomly assigned to. Participants were asked to read the hypothetical message and then answer intention questions based upon the message they just read.

Sample Size Calculation

The target sample size was 500-750, depending on how many segments were proposed within Aim 1 and the size of the segments. Within each segment message cell, there needs to be ~30 participants tested. In order to be 95% confident that responses on 5-point scale are +/- .5 point of the true value, 30 responses are needed within the cell.(Hair et al., 2017) The final sample size for Aim 2 and Aim 3 was 780 participants, of which 658 received a message. 122 of the 780 had completed all recommended doses of the HPV vaccine, so were not randomized to a message.

Data Collection

This Aim is combined with Aim 3. The targeted messages developed in this aim were tested in the cross-sectional survey used to conduct the market segmentation in Aim 3. This survey was conducted via a Qualtrics panel.

Questionnaire

The primary goal of this aim was to test the effectiveness of the created messages in increasing intention to receive the HPV vaccine. The survey began with a screener and then moved on to ask about baseline intentions to receive the HPV vaccine. By asking about intentions at the very beginning of the survey, participants were able to answer truthfully without being swayed by any of the remaining survey questions.

After baseline intentions were identified, the participants were asked to view a hypothetical message about HPV that they were randomized to. After taking time to read the message, participants were asked once again to indicate their intentions to get the vaccine.

Pre-testing

The messages created were sent to the interview participants for review. They were asked to review each message and were provided with the opportunity to leave comments. Thirteen of the participants responded to the survey and provided feedback. The messages were edited to incorporate the feedback provided.

Data Analyses

Analysis was done using SPSS version 25. A paired t-test was used to analyze differences in intention related to which message each segment received. By randomizing participants to a particular message, messages were tested across multiple segments. This

allowed us to see whether one message was effective for multiple segments, or if each segment needs their own targeted message.

Analysis plan by hypothesis

Table 3.4 Analysis Plan

Aim	RQ	Dependent Variable(s)	Independent Variable(s)	Data Analysis
2	RQ3: Which factors predict HPV vaccination uptake?	Uptake (Dichotomous variable)	Awareness, knowledge, attitudes, subjective norms, perceived behavioral control, perceived susceptibility, perceived severity, and perceived barriers as well as demographics (Continuous variables and Dichotomous variables)	Multinomial Regression
2	RQ4: Which factors predict HPV vaccination intention?	Intention (Continuous variable) ranging from 1-5	Awareness, knowledge, attitudes, subjective norms, perceived behavioral control, perceived susceptibility, perceived severity, and perceived barriers as well as demographics (Continuous variables and Dichotomous variables)	Multiple Linear Regression
2	RQ5: Do theory constructs such as attitudes and perceived susceptibility differ based upon vaccination status?	Awareness, knowledge, attitudes, subjective norms, perceived behavioral control, perceived susceptibility, perceived severity, and perceived barriers	Demographics, health behaviors, health-decision making process, relationship status (Continuous and Dichotomous variables)	ANOVA/Chi-square

		(Continuous variables)		
2	RQ6. Which segments exist within the 18-26 year old population that may predict HPV vaccination intention?	To be determined after Phase 1	To be determined after Phase 1	Hierarchical Clustering
3	RQ7: Which messages are effective in increasing intention to vaccinate?	Intention (Continuous variable) ranging from 1-5	Time: pre/post	Paired t-test
3	RQ8: What preferences do 18-26 year old's have for HPV vaccine message delivery?	Trust (Continuous variable)	Stated source of the message (Categorical variable)	Compare means/ANOVA

Challenges

Due to limited funding, this dissertation was completed with just the Aim 1 interviews and Aim 2 survey. Originally, the intent was to define the segments in one survey, create messages for each defined segment, and test these messages across the segments in a second survey. Due to cost considerations for Qualtrics panels, the proposed dual survey approach was consolidated into a single survey. However, all main research questions were still able to be answered using the single survey. Messages were still tested for effectiveness in changing intention within the survey. Messages were developed prior to the Phase 2 survey and participants who have either not started or not completed the vaccine series were randomized to one of these messages at the beginning of the survey. Intention both pre and post message were still collected.

The remaining survey questions remained the same. Segments were defined, and an analysis of which segments saw which messages was conducted. Through the qualitative interviews in Phase 1, we had a general idea of which segments exist within this population. This knowledge along with the current literature helped create the messages to be tested within the survey.

Timeline

Following the proposal of this dissertation on November 19th, 2020, the Aim 1 protocol and documents were submitted to the IRB at the University of South Carolina for review and approval. Pre-testing of the interview script was done in January. Recruitment for interviews began in February. All interviews were completed and analyzed during February and March.

The survey was adjusted in March following insight gained from the interviews. Based upon the results of the qualitative interviews, hypothetical messages were created to be tested in this survey. The survey and the 10 hypothetical messages were pre-tested in March. Documents were submitted to the IRB for approval in March.

The survey was deployed in early April. Final data was received in early May. It took two weeks to collect the required number of responses. Segmentation analysis and message analysis was completed in the month of May.

CHAPTER 4

RESULTS

Aim 1 Results: Qualitative Interviews

The first aim of this dissertation involved one-on-one qualitative interviews with 18-26 year old participants. Through these interviews, barriers and facilitators of HPV vaccination were discussed as well as health behaviors, sexual health, and potential messaging strategies. Interviews lasted about twenty to thirty minutes on average. Following completion of the interview, participants received a $15 eAmazon gift card.

Participant Characteristics

A total of 21 interviews were conducted with participants between the ages of 18 and 26 years old. Both participants who had completed the HPV vaccine series, partially completed, and never started the series were included in the interviews. Participant characteristics can be found in Table 4.1. The majority of interview participants were current U of SC students. Two interview participants had never been to college. Majors of the U of SC students included Biochemistry, Chemistry, Pharmacy, Business, Mass Communications, Biology, Public Health, English/Theater, and Exercise Science. Several participants planned on going to medical school in the future. Two participants were currently enrolled in the Doctor of Pharmacy program. About 38% of participants had never received the HPV vaccine. About 14% had received partial doses of the vaccine and 38% had received all recommended doses.

Table 4.1: Participant Characteristics (N=21)

Sex		**N (%)**
	Male	9 (43%)
	Female	11 (52%)
	Prefer not to say	1 (5%)
Race		
	Asian	2 (10%)
	Caucasian/White	12 (57%)
	African American	4 (19%)
	Other	3 (14%)
Ethnicity		
	Hispanic or Latino	3 (14%)
	Non-Hispanic or Latino	18 (76%)
Major		
	Biochemistry	5 (24%)
	Biology	2 (10%)
	Chemistry/Food Systems & Nutrition Minor	1 (5%)
	Exercise Science	1 (5%)
	English/Theater	1 (5%)
	International MBA	3 (14%)
	MBA/JD	1 (5%)
	Mass Communications	1 (5%)
	Pharm D	2 (10%)
	Public Health	1 (5%)
	Prospective Masters student (Biology)	1 (5%)

Coding and Rating Rules

All interviews were deductively coded by AG. A second researcher, ES, coded 50% of the transcripts. Codes included the constructs from both the Health Belief Model and the Theory of Planned Behavior. Based upon interview questions asked, additional codes beyond the two theories were added to aid in analysis of data, including: health habits, health decision-making, preferred messaging strategies, vaccination experience, HPV knowledge, relationship status, and sexual activity. After running a coding

comparison query on the 10 transcripts coded by both AG and ES, it was found that the researchers had a mean kappa value of 0.83.

After coding was completed, rating rules were used to apply a summary rating of valence and strength to each core construct. The valence refers to whether the construct had a positive or negative influence on intention to vaccinate for HPV. A code's overall valence can be defined as a barrier or facilitator to vaccination. Strength refers to how strong or weak the construct's influence is, with a value of 2 being the strongest. Valence and strength are determined by identifying the number of participants who discussed the constructs as well as the actual comments made by participants about the constructs. For those codes that contained an equal number of comments regarding it as a barrier or facilitator to vaccination, a mixed valence rating was applied. AG independently assigned summary ratings to all core constructs. Ratings were later discussed and verified with the second coder, ES, to confirm results through a peer debriefing process. Codes and their summary ratings, if applicable, are described in detail below.

Health Belief Model—Perceived Susceptibility

Perceived susceptibility describes how at risk an individual feels for a health condition. Participants were first asked to describe their current risk for getting a sexually transmitted infection. Later in the interview, they were asked about risk of getting HPV specifically. Then they were asked to state the chance that HPV would turn into cancer. Overall, participants felt that they were not at risk for STIs or HPV specifically. When asked about the chance that HPV would turn into cancer, the most common answer was 30-40%. It is important to note that some participants had no idea that HPV had the potential to cause six different types of cancer affecting both men and women.

Perceived susceptibility was assigned a (-2) rating for its influence on intentions to vaccinate for HPV. This rating was assigned due to the fact that the majority of participants that were not completely vaccinated did not feel that they were at risk. For example, one participant stated, “I feel like I'm on the other side of the spectrum for at risk for it.” Later in the interview, many of these participants would go on to explain that they had no intention of getting the vaccine because of their perceived low risk status. For example, one participant went on to say, “I mean if I led a different lifestyle, perhaps it would be a lot more effective, but as I am right now, I don't believe it's that much of a detriment to how I live.”

Health Belief Model – Perceived Severity

Perceived severity refers to the seriousness of a health condition, or in this case, how serious it would be if the individual got HPV. Perceived severity of HPV did not come up within the interviews very often, but when it did, the majority of participants did not feel that HPV was as serious compared to other conditions. For example, one participant noted, “I did see reports of people that had paralysis, and this generally happened with the second dose and not with the first, and that was scary for me because, again with the Weighing your risk versus benefit I would much rather be at risk, for you know getting HPV rather than becoming paralyzed.” However, it is important to note that some participants were unaware of the association between HPV and cancer. When learning about the six different types of cancer caused by HPV, participants were shocked (see more within Reactions to HPV Information). Because of these mixed comments regarding perceived severity as either a barrier or facilitator, it was assigned a mixed rating of (X).

Health Belief Model – Perceived Barriers

Perceived barriers describe the negative effects of a behavior change. In the case of HPV vaccination, what are the things that prevent someone from completing the vaccine series? A few participants described HPV vaccination as a fairly easy process. Some participants had started the series and never completed it due to a slew of barriers, including bad reactions, scheduling issues, or just feeling unsure about the vaccine itself. For example, one participant started the series but never completed it, explaining "I feel like I went to college or something. And that's why I didn't get the third shot, because I would have had to drive home like three and a half hours to get it and I didn't know if you could get it like where I was at, I don't know if I just like didn't call because I didn't want like have to go through like the insurance and like oh. This people on my provider blah blah, so it was just easier if I didn't do it, and then time went by, and I just forgot about the third one." Barriers play a strong role in someone's intentions to complete this series, which results in its summary rating of (-2).

Health Belief Model – Perceived Benefits

Perceived benefits include the positive beliefs about the behavior. In this case, what will happen if someone gets the HPV vaccine? Throughout the interviews, most participants had good things to say about the HPV vaccine. Even the participants that didn't know much about HPV or the vaccine, ended up saying that the vaccine was probably a smart idea for most people. However, just because they believed the HPV vaccine had benefits did not mean that they themselves wanted to get the vaccine. Going back to perceived susceptibility, one participant stated, "I think, depending on the stage in my life, I think, if I had known about it when I was or if I didn't get it and I learned about

it at a stage in my life when I was with more than one partner, then I would have gotten it But if I learned about it later in life when I was only with one partner and wasn't too worried about the possibility of STDs, then I probably wouldn't have gotten it." Because of this, perceived benefits was assigned a summary rating of (+1).

Health Belief Model – Cues to Action

Cues to action are reminders or prompts for behavior change. The main one for HPV vaccination is a doctor recommendation. Only a few participants admitted that a doctor had never offered the vaccine to them. The rest of the participants had had the vaccine recommended to them at least once by a doctor, and many had agreed to the vaccine after it was mentioned the first time. A doctor's recommendation is often the number one predictor of vaccination. One participant explained, "Yeah oh yeah they used to be like pretty chronic and I think that's why the whole HPV thing came up. Because I kept going to my doctor a bunch and she's like by the way like this is an option, it has nothing to do with UTIs, but I thought I'd bring it up since you're here all the time." Cues to action usually led to vaccination, which resulted in it being assigned a (+2) summary rating.

Health Belief Model – Self-Efficacy

Self-efficacy describes confidence in one's ability to change behavior. Throughout the interviews, participants were often hesitant about their ability or intention to get vaccinated. For example, one participant stated, "I've just been forgetting to. I things have been really busy at home and in life in general lately, and I just haven't set the time aside to make an appointment and get it done, especially with the coronas happening I'm not as comfortable going in just for little things, especially if I only have the one

sexual partner. it's not as much of a priority right now does other things would be." It was often unclear whether participants had the ability to complete the HPV vaccine series or even felt confident in their ability to start the process. Because of this, self-efficacy was assigned a (-1) summary rating.

Theory of Planned Behavior – Attitudes

Attitudes include a person's beliefs about what will happen if they complete the behavior and whether the outcome is good or bad. Similar to perceived benefits, attitudes was assigned an overall summary rating of (+1). Generally, participants had positive comments regarding the HPV vaccine and agreed that they would recommend the vaccine to friends or family members in the future. However, these positive attitudes were often not enough to actually change intentions to get the vaccine. For example, when discussing the high effectiveness of the HPV vaccine, one participant stated, "Ok that's encouraging. I still don't know that I would change my mind honestly about getting it."

Theory of Planned Behavior – Subjective Norms

Subjective norms refer to a person's beliefs about what other people in their social group will think and their motivation to comply with these perceived norms. In the case of HPV vaccination, parents and healthcare professionals were included within an individual's social group in addition to friends. When making the decision to vaccinate for HPV, parents and doctors are often intimately involved so it was important to include them within this category. Subjective norms was assigned a neutral summary rating of (X) because it was found to have mixed effects on intentions to vaccinate. Sometimes subjective norms was found to influence vaccination intention (either in a positive or

negative way) and other times, it had no effect at all. For example, one participant explains how a friend was diagnosed with HPV even after getting the vaccine, saying "Obviously, sometimes I feel like I should probably just you know restart and get it, but to be completely honest I know what like I just I don't know I, I guess I just don't know that much about it and I probably should research it a little more, but like my friend did get fully vaccinated and still got HPV and like I know a lot of other people like that, too, so um at this point, I'm like is it even worth it? Like what's the point?" Another participant described how both her mom and doctor encouraged her to get the vaccine, saying "Honestly, it was my mom like she's like all right she's like P13, you keep like not doing it, and I really want you to get it this year. And she kept asking and kept asking, so I was just like Okay, and then, when I finally went to my family physician, she was like Have you had your flu shot and she was like do you want it and at first, I was like no, then I was just like hey, why not, so I did."

Theory of Planned Behavior – Behavioral Intentions

For those that had either never received a dose of the HPV vaccine or had partially completed it, intentions were mostly positive. Often, participants had started the series and wanted to complete it but faced some kind of hurdle. Because of this, behavioral intentions received an overall summary rating of (+1).

Theory of Planned Behavior – Perceived Behavioral Control

Perceived behavioral control refers to a person's beliefs about factors that will make it easy or difficult to perform the behavior and the amount of power that person has over performing the behavior. Similar to self-efficacy, perceived behavioral control received an overall summary rating of (-1). For the participants who had either never

started the series or just hadn't completed the series, there were several barriers in their way, and they seemed unsure of their ability to overcome these barriers.

Relationship Status

Relationship status played a major role in intentions to vaccinate. Often it tied in with perceived susceptibility and resulted in participants feeling that they were at a lower risk status if they were in a relationship. For example, one participant stated, "I am married. And so, I've only been in sexual relations with my wife." Even if participants weren't married, they had unwavering faith in their relationship status. One participant stated, "Right now I'd prob, hopefully say it would be pretty low because I've been just because I've been in a long term relationship, like me and my boyfriend have been together for like five ish years so haven't really been with anyone else I, hopefully, it would be pretty low." Because of this, relationship status was assigned an overall summary rating of (-2).

Sexual Activity

Sexual activity goes along with relationship status but was assigned a slightly lower summary rating of (-1). This is due to the fact that for two participants, sexual activity was the reason that they chose to be vaccinated. One participant stated, "however, he was doing other things and I ended up um contracting chlamydia from him, and so, from that point forward, I was just like yeah so at that point, I would just say I was like very young and dumb and then now I'll try to rectify that." However, sexual activity, or lack of, often resulted in participants to feel that they did not need to be vaccinated. For example, one participant stated, "Well currently very low. Because you know. But um. I would, I would say, still in general pretty low. I haven't done anything

before my current girlfriend and she hasn't done anything before me, so I don't really see how that would happen unless you know something, you know, God forbid, something else happened." Because the majority viewed sexual activity as a barrier to vaccination, sexual activity was assigned an overall summary rating of (-1).

HPV Knowledge/ Reactions to HPV Information

Overall, HPV knowledge was low. One participant stated, "Um Is, I don't actually, I won't even pretend to know," when asked about what HPV causes. The participants that had either been vaccinated or intended to get vaccinated knew much more about HPV and the vaccine compared to people that had never been vaccinated. However, for many participants, when hearing about the cancer types associated with HPV, they were shocked. For example, one participant responded, "Well, that's definitely terrifying. Had that information been presented to me, I may have thought differently in the past," when hearing about the HPV-related cancers affecting men. Information has the ability to change intentions to vaccinate—acting as either a barrier or facilitator. Correct information presented in the correct way can increase intentions, but misinformation has the power to decrease intentions. Because of this, HPV knowledge is assigned an overall mixed summary rating of (X).

Vaccination Experience – the Flu Vaccine

Participants were asked about past experiences with vaccinations. When asked this general question, almost all participants described how they stayed up to date on vaccinations and were not "anti-vax." The follow-up question to this asked about when they last received a flu shot. Despite just stating that they stayed up to date on all

vaccinations, about half of the participants would admit that they had either never received a flu shot or had only received one periodically in their life.

Table 4.2 Core Constructs and Associated Summary Ratings

Construct/Code	Subcodes	Rating	Quotes
Health Belief Model	Perceived Susceptibility	(-2)	"P9: *Right yeah, but I think in terms of vaccines, the biggest part's just how I see myself, like my risk perception, I guess, does I feel, like most do most people say they're low risk? Not everybody can be low risk, right?"*
	Perceived Severity	(X)	"P8: *whenever it first happened, I was upset about it, but then I was like I mean like a lot of Americans like have it, so I was like it's not like the biggest deal at least it's not like herpes or something like that."*
	Perceived Barriers	(-2)	"P18: *I've had good, all good experiences nothing that like really comes to mind, except for the HPV vaccine, I just remember like I, I mean, I guess, it was pretty young when I got I got the first dose of it and, just like had a really bad reaction to it, for some reason I don't know if it was just like a mental thing because I like was so scared to get it or whatnot, but I just remember, even at that age, I was like okay got the first one, not going to go back for any other."*
	Perceived Benefits	(+1)	"P14: *um well like I said I'm said I'm sexually active, so it was like you know, I was you know, I was yeah definitely sexually active by then, so I was like I should probably look into that and also just you know if it if it will help me, you know vaccines are generally like I said I have I'm pretty pro vaccine so like you know anything that could help my*

			health and not get cancer is usually good."
	Self-Efficacy	(-1)	"P1: *yeah, I would say so, I'd have to do research on the vaccine though, I like to definitely know what I'm getting shot up with."*
	Cues to Action	(+2)	"P2: *I know, I think it's a sexually transmitted disease, because I had to get it at the gynecologist basically that's all I know about it, I don't really know what causes it or I just know my mom told me to get it, and my gynecologist told me to get it, so I did."*
Theory of Planned Behavior	Attitudes	(+1)	"P17: *So, for you know, to save myself and others the worry of what if, and you know the pain that might be associated long term with it."* "P17*: yeah, I mean at that point, if we can, if modern medicine can prevent something, and it has that 90% Effectiveness level, I don't see why not."*
	Subjective Norms	(X)	"P4*: Um I think around me...Well I'm originally from[..]so that's definitely one of the shots that get promoted in our school system, so I know my family at least has it and a lot of my friends from back home have gotten the shots."* "P14: *Uh that's not something that has come up in casual conversation um I don't I don't remember any of my friends mentioning it."* "P10: *They can get the Gardasil vaccine, the two doses um which, as I said, my friend did that and unfortunately she*

			still ended up with HPV….”
	Behavioral Intentions	(+1)	“P14: … *so I actually ended up getting two out of three and then supposed to get the third, COVID hit, and so I still haven't gotten the third dose so I don't really know how that works and so I'm scared to ask at this point, but I need to like make some calls.”*
	Perceived Behavioral Control	(-1)	“P8: *…And that's why I didn't get the third shot, because I would have had to drive home like three and a half hours to get it and I didn't know if you could get it like where I was at, I don't know if I just like didn't call because I didn't want like have to go through like the insurance and like oh. This person's on my provider blah blah, so it was just easier if I didn't do it, and then time went by, and I just forgot about the third one.”*
Relationship Status		(-2)	“P20: *um I mean nothing I haven't really listed for the sexual health; I only have one partner I've only ever really had one partner so that's my current boyfriend. And I don't really expect that relationship to end anytime soon so.”*

Sexual Activity		(-1)	"P11*: I guess currently no because I've had the same partner for like the last six months about um. yeah, it is currently no, in the past, maybe had some questionable experiences, but I just like I don't know, I didn't think about it and now, I don't think I still don't think about it until like right now. No, I don't think so."*
HPV Knowledge/Reactions to HPV Information		(X)	"P1: *um I don't wait...HPV. This is herpes, right?"* "P10: *But after going home I researched HPV vaccine and I felt very uncomfortable with some of the information that I found, um this was years ago so I'm not sure at how you know, true, all this information that I found was, but I did see reports of people that had paralysis and this generally happened with the second dose and not with the first, and that was scary for me because , again with the weighing your risk versus benefit I would much rather be at risk, for you know getting HPV rather than becoming paralyzed"* "P2: *I had no idea, it could lead to six different cancers, so now knowing and like having never seen anything about it."*

Aim 2: Market Segmentation

A national cross-sectional survey was used to define the segments within this 18-26 year old age group. The survey allowed us to understand the preferences and characteristics of each segment and understand which messaging strategies each segment prefers.

Participant Characteristics/Demographics

This survey was completed by 780 respondents. Out of this total, 122 had completed all doses of the HPV vaccine, 207 had partially completed the series, and 451 had never started the series. 47.6% of respondents reported being assigned male at birth, while 51.7% of respondents reported being assigned female at birth. See below for more demographic information.

Table 4.3 Survey Participant Demographics (N=780)

Variable	N (%)
Vaccine Completion Status	
Completed	122 (15.6)
Partial	207 (26.5)
None	451 (57.8)
Age (Mean = 21.75 / SD = 2.475)	
18	97 (12.4)
19	72 (9.2)
20	103 (13.2)
21	109 (14.0)
22	95 (12.2)
23	85 (10.9)
24	74 (9.5)
25	86 (11.0)
26	59 (7.6)
Biological Sex	
Male	371 (47.6)
Female	403 (51.7)

Gender Identity	
Man	338 (43.3)
Woman	347 (44.5)
Trans man	22 (3.8)
Trans woman	6 (0.8)
Non-binary	59 (7.6)
Other	8 (1.0)
Race	
White	455 (58.3)
Black or African American	157 (20.1)
American Indian or Alaskan Native	20 (2.6)
Asian	72 (9.2)
Native Hawaiian or Pacific Islander	10 (1.3)
Other	66 (8.5)
Sexual Orientation	
Heterosexual (Straight)	499 (64)
Homosexual (Gay/Lesbian)	49 (6.3)
Bisexual	160 (20.5)
Asexual	26 (3.3)
Other	46 (5.9)
Relationship Status	
Single	502 (64.4)
Dating	209 (26.8)
Married	66 (8.5)
Divorced	3 (0.4)
Rurality	
Urban	240 (30.8)
Suburban	353 (45.3)
Rural	122 (15.6)
Not sure	65 (8.3)
Highest Level of Education	
Some high school	65 (8.3)
High school diploma or GED	230 (29.5)
Some college	226 (29.0)
College degree	185 (23.7)
Masters or other graduate degree	65 (8.3)
Did not complete high school	9 (1.2)
Religious Status	

Yes	316 (40.5)
No	464 (59.5)
Political Affiliation	
Republican	126 (16.2)
Democrat	333 (42.7)
Independent	174 (22.3)
No preference	147 (18.8)

Factor Analysis & Reliability Testing

Exploratory factor analysis using principal components and varimax rotation was used to confirm that the actual structure of items was consistent with intended structure of items. Reliability testing was done on all scales with a Cronbach's alpha of 0.7 or greater being deemed acceptable.

Many of the scales included within this survey were borrowed from previous studies. Therefore, factor analysis and reliability testing had been previously conducted on the majority of these scales. Because some of the scales were adapted to meet the needs of this study, factor analysis and reliability testing was conducted again to ensure that the scales being used were accurate. Please see below for a brief overview of the major variable scales used within this survey. More details about these variables will be included when discussing results of the segmentation analysis.

Theory of Planned Behavior—Attitudes

Attitudes consisted of a four-item scale that was adapted from Gerend (Gerend 2012). The last item, "I believe there is a stigma related to the HPV vaccine was reverse coded. Originally, the adapted scale consisted of five items, but the last item was removed to improve overall reliability. It was removed from the scale, resulting in a scale with much higher reliability.

Table 4.4 Attitudes Rotated Component Matrix

Item	Component	Communalities
Getting the HPV vaccine will help protect me from HPV infection	0.793	0.629
Getting the HPV vaccine will help protect me from developing HPV-related cancers	0.839	0.703
Getting the HPV vaccine is the right thing to do for me	0.840	0.706
Getting the HPV vaccine is the right thing to do for others	0.848	0.720
I believe there is a stigma related to the HPV vaccine	-0.541	0.293

Table 4.5 Attitudes Reliability

Scale	Items	Cronbach's alpha	Mean (SD)
Attitudes (original)	5	0.580	16.47 (3.37)
Attitudes (one item removed)	4	0.848	13.55 (3.64)

Theory of Planned Behavior—Subjective Norms

Subjective norms was an adapted scale borrowed from Gerend. When running factor analysis on this scale, only one component was present, explaining 53.997% of the variance, and reliability was 0.827. No changes were made to the scale.

Table 4.6 Subjective Norms Rotated Component Matrix

Item	Component	Communalities
My parents feel that I should get the HPV vaccine	0.699	0.488
I want to do what my parents feel is best	0.649	0.421
My friends feel that I should get the HPV vaccine	0.788	0.621
I want to do what my friends think is best	0.762	0.581

Getting the HPV vaccine seems to be the popular thing to do among people my age	0.769	0.591
I want to do what people my age are doing	0.734	0.539

Table 4.7 Subjective Norms Reliability

Scale	Items	Cronbach's alpha	Mean (SD)
Subjective Norms	6	0.827	18.57 (4.933)

Theory of Planned Behavior—Perceived Behavioral Control

Perceived behavioral control was borrowed from Gerend. When running factor analysis on this scale, only one component was present, explaining 73.898% of the variance, and reliability was 0.882. No changes were made to the scale.

Table 4.8 Perceived Behavioral Control Rotated Component Matrix

Item	Component	Communalities
I feel confident that I can ask my doctor (or other healthcare professional) about getting the HPV vaccine	0.835	0.697
I feel confident that I can make an appointment to get the HPV vaccine	0.864	0.747
I feel confident that I can get the HPV vaccine even if I don't like getting a shot	0.890	0.792
I feel confident that I can get the HPV vaccine even if it means I need to get multiple doses	0.848	0.720

Table 4.9 Perceived Behavioral Control Reliability

Scale	Items	Cronbach's alpha	Mean (SD)
Perceived Behavioral Control	4	0.882	13.69 (3.968)

Theory of Planned Behavior—Behavioral Intentions

When running factor analysis on this scale, only one component was present, explaining 73.197% of the variance, and reliability was 0.907. No changes were made to the scale.

Table 4.10 Behavioral Intentions Rotated Component Matrix

Item	Component	Communalities
How likely is it that you'll try to get more information about the HPV vaccine?	0.77	0.595
How likely is it that you'll consider getting the HPV vaccine?	0.893	0.797
How likely is it that you'll try to get the HPV vaccine?	0.903	0.815
How likely is it that you'll actually get the HPV vaccine?	0.887	0.786
If a doctor offered you the HPV vaccine within the next year, how likely is it that you'd get vaccinated?	0.817	0.667

Table 4.11 Behavioral Intentions Reliability

Scale	Items	Cronbach's alpha	Mean (SD)
Intentions	5	0.907	14.69 (5.406)

Health Belief Model—Perceived Susceptibility

Perceived susceptibility was borrowed from Gerend. When running factor analysis on this scale, two components were present but reliability for the scale overall was high at 0.917. The first component explained 60.066% of the variance while the second component explained 13.587%. Because this scale had been previously validated and the reliability as is was high, no changes were made to the scale.

Table 4.12 Perceived Susceptibility Rotated Component Matrix

Item	Component 1: Likelihood	Component 2: Vulnerability	Communalities
If you don't get vaccinated for HPV, how likely is it that you'll get (a genital HPV infection) in the future?	0.288	0.869	0.837
If you don't get vaccinated for HPV, how likely is it that you'll get (HPV-related cancer) in the future?	0.275	0.884	0.856
If you don't get vaccinated for HPV, how likely is it that you'll get (genital warts) in the future?	0.304	0.848	0.812
If I don't get vaccinated for HPV, I think my chances for getting (a genital HPV infection) in the future are	0.789	0.246	0.684
If I don't get vaccinated for HPV, I think my chances for getting (HPV-related cancer) in the future are	0.790	0.245	0.684
If I don't get vaccinated for HPV, I think my chances for getting (genital warts) in the future are	0.796	0.244	0.693
If I don't get vaccinated for HPV, I would feel vulnerable to the following conditions (genital HPV infection) in the future	0.781	0.295	0.697
If I don't get vaccinated for HPV, I would feel vulnerable to the following conditions (HPV-related cancer) in the future	0.793	0.284	0.710
If I don't get vaccinated for HPV, I would feel vulnerable to the following conditions (genital warts) in the future	0.765	0.263	0.655

Table 4.13 Perceived Susceptibility Reliability

Scale	Items	Cronbach's alpha	Mean (SD)
Perceived Susceptibility	9	0.917	25.63 (8.109)
Component 1: Likelihood	3	0.903	8.77 (3.186)
Component 2: Vulnerability	6	0.910	16.84 (5.810)

Health Belief Model—Perceived Severity

Perceived severity was borrowed from Gerend. When running factor analysis on this scale, only one component was present, explaining 70.413% of the variance, and reliability was 0.916. No changes were made to the scale.

Table 4.14 Perceived Severity Rotated Component Matrix

Item	Component	Communalities
Being infected with HPV would have major consequences on my life	0.754	0.569
Having an HPV-related cancer would have major consequences on my life	0.853	0.727
Having genital warts would have major consequences on my life	0.856	0.733
Being infected with HPV would be devastating to me	0.850	0.723
Having an HPV-related cancer would be devastating to me	0.871	0.759
Having genital warts would be devastating to me	0.845	0.714

Table 4.15 Perceived Severity Reliability

Scale	Items	Cronbach's alpha	Mean (SD)
Perceived Severity	6	0.916	21.01 (6.121)

Health Belief Model—Perceived Benefits

Perceived benefits was adapted from Gerend. When running factor analysis on this scale, only one component was present, explaining 71.061% of the variance, and reliability was 0.898. No changes were made to the scale.

Table 4.16 Perceived Benefits Rotated Component Matrix

Item	Component	Communalities
Getting vaccinated for HPV will help protect me from genital HPV infection	0.819	0.671
Getting vaccinated for HPV will help protect me from having an HPV-related cancer	0.864	0.746
Getting vaccinated for HPV will help protect me from having genital warts	0.842	0.709
If I get vaccinated for HPV, I can reduce my risk of developing HPV-related cancer	0.865	0.748
Getting vaccinated for HPV will decrease my chances of getting genital warts	0.824	0.680

Table 4.17 Perceived Benefits Reliability

Scale	Items	Cronbach's alpha	Mean (SD)
Perceived Benefits	5	0.898	17.39 (4.744)

Health Belief Model—Perceived Barriers

The perceived barriers section was adapted from Gerend. Many more barriers were added to this list based upon insight gained through the literature and the interviews conducted in Aim 1. When running a factor analysis on all 25 items, 5 components were identified. Barriers were able to be separated into smaller groups, including vaccine belief/hesitancy barriers, safety concerns barriers, access barriers, risk barriers, and time barriers. Overall, the reliability of the 25 item scale was 0.903. However, when

characterizing the segments, the specific barrier groups were used to discover the main hurdles faced by each individual segment, in addition to understanding overall barriers.

Table 4.18 Perceived Barriers Rotated Component Matrix

	Components				
Item – To what extent are the following barriers to HPV vaccination?	**Vaccine Beliefs/Hesitancy**	**Safety Concerns**	**Access**	**Risk Perception**	**Time**
Against religious beliefs	**0.778**			0.136	
Do not get vaccines	**0.758**				
Friends wouldn't approve	**0.723**		0.117		0.128
Hesitant about the HPV vaccine specifically	**0.658**	0.360		0.117	
Hesitant about vaccines in general	**0.632**	0.402	0.125		
Parents wouldn't approve	**0.628**			0.246	0.132
Shots are scary	**0.603**	0.196		0.146	0.119
Currently in a committed relationship	**0.322**	0.173	0.290		0.216
Worried about side effects	0.175	**0.735**	0.172		
Would have to ask questions before getting it	0.154	**0.710**		0.165	0.164
Safety concerns about the vaccine	0.233	**0.708**	0.196		
Would have to do research before getting it	0.119	**0.708**		0.180	0.200
Want a doctor recommendation		**0.669**	0.192	0.231	0.179
Health insurance issues		0.161	**0.803**		
Cost		0.220	**0.740**	0.126	
Access to the vaccine		0.230	**0.633**		0.277
Lack of nearby primary care doctor	0.372		**0.476**	0.392	0.146
Transportation issues	0.366		**0.430**	0.416	0.153
Not sexually active	0.128	0.163		**0.699**	
Don't know where to get the vaccine	0.194		**0.352**	0.604	0.131
Don't know how to schedule an appointment to get it	0.256		**0.359**	0.574	0.146
Don't feel at risk for HPV		0.299		**0.560**	0.222
Having to schedule an appointment first	0.125	0.141	0.151	0.138	**0.820**

No extra time to get it	0.251	0.124	0.161		**0.744**
Having to schedule two to three appointments to complete the series		0.233	0.148	0.257	**0.706**

Table 4.19 Perceived Barriers Reliability

Scale	Items	Cronbach's alpha	Mean (SD)
Barriers_Overall	25	0.903	75.22 (16.355)
Barriers_Vaccine Beliefs/Hesitancy	8	0.840	22.37 (6.753)
Safety Concerns	5	0.823	15.96 (4.557)
Access	7	0.821	21.36 (5.649)
Risk Perception	2	0.509	6.36 (2.053)
Time	3	0.762	9.17 (2.804)

Health Belief Model—Self-Efficacy

Self-efficacy was borrowed from Gerend. When running factor analysis on this scale, only one component was present, explaining 67.019% of the variance, and reliability was 0.751. No changes were made to the scale.

Table 4.20 Self-Efficacy Rotated Component Matrix

Item	Component	Communalities
I feel confident in my ability to get the HPV vaccine even if it is expensive	0.713	0.508
I feel confident in my ability to get vaccinated for HPV, even if getting the shot hurts a little	0.865	0.747
I feel confident in my ability to get vaccinated for HPV, even if it means finding the time to go to the doctor three times	0.869	0.755

Table 4.21 Self-Efficacy Reliability

Scale	Items	Cronbach's alpha	Mean (SD)
Self-efficacy	3	0.751	9.75 (2.783)

Health Consciousness Scale

The health consciousness scale was borrowed from Gould. This is a validated scale that has been used for years (Gould 1988). When running factor analysis on this

scale, only one component was present, explaining 58.714% of the variance, and reliability was 0.912. No changes were made to the scale.

Table 4.22 Health Consciousness Scale Rotated Component Matrix

Item	Component	Communalities
I reflect about my health a lot	0.753	0.567
I'm very self-conscious about my health	0.709	0.503
I'm generally attentive to inner feelings about my health	0.802	0.643
I'm constantly examining my health	0.756	0.571
I'm alert to changes in my health	0.793	0.628
I'm usually aware of my health	0.799	0.638
I'm aware of the state of my heath as I go through the day	0.805	0.648
I notice how I feel physically as I go through the day	0.722	0.521
I'm very involved with my health	0.752	0.565

Table 4.23 Health Consciousness Scale Reliability

Scale	Items	Cronbach's alpha	Mean (SD)
Health Consciousness	9	0.912	32.55 (7.669)

Regulatory Focus: Prevention versus Promotion

The regulatory focus questionnaire was developed by Higgins to determine whether an individual is promotion or prevention focused. An adapted version of his 11-item scale was used within this survey, which was missing the question "did you get on your parents' nerves often when you were growing up?" (Higgins 2001) In order to calculate regulatory focus, one must first calculate the scores for promotion and prevention, and then subtract the prevention score from the promotion score. Positive values are associated with a promotion predominance. Values of zero are associated with equal promotion and prevention tendencies. Negative values are associated with a prevention predominance (Cesario 2008).

Calculations: RF = promotion – prevention

Promotion = [(6 – Q1) + Q3+ Q6 + (6 – Q8) + Q9 + (6 – Q10)] / 6

Prevention = [(6 – Q2) + Q4 + (6 – Q5) + (6 – Q7)] / 4

Table 4.24 Regulatory Focus Reliability

Scale	Items	Cronbach's alpha	Mean (SD)
Regulatory Focus	10	0.740	32.06 (6.018)

HPV Knowledge

HPV and HPV vaccine knowledge was adapted from Waller's HPV knowledge scale. Questions specific to the types of cancer caused by HPV were added as well as updated information about vaccine eligibility. This scale is calculated by scoring 1 point for correct answers and 0 points for incorrect or "don't know" answers. There were 29 items within this scale, meaning that the highest score someone could achieve would be 29. KR-20 was calculated to be 0.910.

Table 4.25 HPV Knowledge Sum KR-20

Scale	Items	KR-20	Mean (SD)
HPV Knowledge	29	0.910	10.22 (7.254)

Aim 2 Results

Baseline HPV Knowledge—Open Ended Comments Results

Participants were given the opportunity to provide open-ended feedback about what they knew about HPV, the HPV vaccine, as well as reasons for getting or not getting the vaccine. Please see the tables below for comments written by participants. Each comment is followed by an indication of vaccination status (completed, partial, or none).

Table 4.26 Baseline HPV Knowledge Open-Ended Comments

General Category	Quote (Vaccination Status)
Don't know/Low Knowledge	*"Absolutely nothing" (Partial)* *"Honestly, not a whole lot. I mean, I've read a few articles about it" (Partial)* *"I think it stands for human papilloma virus?" (None)* *"Not much, my pediatrician told me to get the vaccine, so I did" (Partial)* *"Not much, that it was required/recommended for college to be vaccinated" (Partial)* *"Very little outside of friends confiding that they contracted it…" (None)*
STI/Disease	*"An infection that causes warts at various parts of the body" (Partial)* *"Can cause problems in women" (Partial)* *"Contagious and can have no symptoms" (None)* *"HPV is a sexually transmitted disease that prevents you from having unprotected sex and can be with you for your entire life unless treated early" (Completed)* *"I know it's more common in women" (None)* *"It can be spread by sexual contact and isn't curable" (None)*
Cancer	*"Can cause cancer and death, not good" (Partial)* *"Causes ovarian cancer" (Completed)* *"Harmless and most time goes away with a risk of cancer" (Completed)* *"I know it can cause cancer and the best thing is to get an HPV shot" (Partial)* *"It can cause cancer but doesn't affect everyone" (Completed)*
Death	*"Deadly" (None)* *"It can kill you" (None)* *"It is a very bad spreadable transmissible virus that could kill you overtime" (None)* *"It's a deadly disease" (Partial)*

Other	*"It doesn't have a test to detect it" (Completed)* *"It affects the LGBT community" (None)* *"It is a ghost in women, and does nothing to men" (Completed)* *"It is prevalent in younger people" (Completed)*

Table 4.27 Baseline HPV Vaccine Knowledge Open-Ended Comments

General Category	Quote (Vaccination Status)
Don't Know/Almost Nothing	*"Also not much. I've heard brief bits of information about it, both positive and negative" (None)* *"I didn't know there was a vaccine" (None)* *"I believe it's a 2 or 3 dose vaccine that prevents some cancers and some sort of disease" (Completed)* *"It keeps you safe???" (Completed)*
Sources of Information	*"Ads and news" (Partial)* *"Doctors and tv" (Partial)* *"From newsletters" (None)* *"I've seen commercials for it but that is it" (None)* *"…I know I got guard[asil] because those commercials "I want to be one less, one less. O-N-E-L-E-S-S" (Completed)* *"My best friend told me about it" (None)* *"My parents told me about it" (Partial)*
Side Effects	*"It can hurt more than help" (None)* *"It can make you sick" (None)* *"It causes cancer" (None)* *"Might have chemicals that are bad for you in it" (None)*
Prevention	*"All I know is that it's supposed to guard you against this virus" (None)* *"2 doses, protects children" (Completed)* *"Came out in 2006, prevents 30% of cancers" (Completed)* *"HPV vaccination is preventing cancer-causing infections and precancers. HPV infections and cervical precancers (abnormal cells on the cervix…" (None)* *"It cures HPV supposedly" (None)*
Other	*"Had to get it to go to college" (Partial)* *"Not much. Don't believe in most vaccines, medications, and medical procedures" (None)*

Table 4.28 Reasons for getting the Vaccine Open-Ended Comments

General Category	Quote (Vaccination Status)
Cancer Prevention	*"As a precaution for future possibilities" (Partial)* *"Because I do not want to have breast cancer when I am over 30" (Partial)* *"Because I thought I had it before, so I got myself chec[ed]" (Partial)* *"Cancer in family" (Partial)*
Norms	*"Doctor and I agreed that I should get it" (Completed)* *"Because they practically make you when you're 12" (Completed)* *"Because my doctor told me to" (Partial)* *"Because my parents wanted me to" (Completed)*
Other	*"I don't know" (Partial)* *"Had to before school" (Completed)* *"It was on my list of vaccinations that was needed" (Completed)* *"Because I'm very sexually active with both genders" (Partial)* *"Just to be safe" (Completed)*

RQ3: Which factors predict HPV vaccination uptake?

Vaccination status had three categories: completely vaccinated, partially vaccinated, and never vaccinated. A multinomial logistic regression was run to determine which factors predicted vaccination status and thus vaccination uptake. In the initial model, factors chosen as predictors included: perceived barriers, knowledge score, health consciousness scale, self-efficacy, perceived behavioral control, perceived severity, subjective norms, perceived benefits, and various demographics including race, religion status, and highest level of education completed.

The final model revealed that subjective norms, knowledge, attitudes, gender identity, and race were the most important factors when predicting vaccination status. Please see Table 4.35 below for model information. Please note that within the vaccination status variable (named *vaxstatus*), 1=fully vaccinated, 2= partially vaccinated, and 3=not vaccinated.

Table 4.29 Predicting Vaccination Uptake Likelihood Ratio Tests (N=780)

Effect	-2 Log Likelihood of Reduced Model	Chi-Square	df	Significance
Intercept	1265.995	0.000	0	
Subjective Norms	1304.028	38.033	2	<0.001
Knowledge Sum	1335.054	69.058	2	<0.001
Attitudes	1278.953	12.957	2	0.002
Gender Identity	1290.356	24.361	4	<0.001
Race	1284.385	18.390	4	0.001

Table 4.30 Predicting Vaccination Uptake Parameter Estimates (N=780)

Vaxstatus = Fully Vaccinated	**B**	**Std. Error**	**Wald**	**df**	**Sig.**	**Exp(B)**	**95% CI Lower Bound**	**95% CI Upper Bound**
Intercept	-6.280	0.710	78.329	1	<0.001			
Norms	0.659	0.153	18.540	1	<0.001	1.932	1.432	2.607
Knowledge	0.090	0.017	28.668	1	<0.001	1.094	1.059	1.131
Attitudes	0.326	0.139	5.461	1	0.019	1.385	1.054	1.820
Gender Identity-Man	-0.839	0.359	5.470	1	0.019	0.432	0.214	0.873
Gender Identity – Woman	0.216	0.342	0.398	1	0.528	1.241	0.635	2.424
Gender Identity – Other								
Race – White	1.281	0.332	14.932	1	<0.001	3.602	1.880	6.900
Race – Black	0.901	0.395	5.213	1	0.022	2.463	1.136	5.338
Race – Other								

Vaxstatus = Partially Vaccinated	**B**	**Std. Error**	**Wald**	**df**	**Sig.**	**Exp(B)**	**95% CI Lower Bound**	**95% CI Upper Bound**
Intercept	-3.671	0.542	45.797	1	<0.001			
Norms	0.700	0.130	29.021	1	<0.001	2.013	1.561	2.597
Knowledge	0.100	0.014	53.049	1	<0.001	1.105	1.076	1.135
Attitudes	-0.187	0.109	2.949	1	0.086	0.829	0.670	1.027
Gender Identity-Man	-0.380	3.03	1.574	1	0.210	0.684	0.378	1.238
Gender Identity – Woman	0.304	0.297	1.047	1	0.306	1.355	0.757	2.425
Gender Identity – Other								

Race – White	0.493	0.233	4.481	1	0.034	1.637	1.037	2.585
Race – Black	0.278	0.282	0.976	1	0.323	1.321	0.760	2.294
Race – Other								

RQ4: Which factors predict HPV vaccination intention?

A linear regression was utilized to determine which factors predict vaccination intention in those that were not yet fully vaccinated. Baseline intention was the dependent variable, with several variables tested as independent predictor variables. In the initial model, factors chosen as predictors included: perceived barriers, knowledge score, health consciousness scale, self-efficacy, perceived behavioral control, perceived severity, subjective norms, perceived benefits, and various demographics including race, religion status, and highest level of education completed.

The final model contained six variables: biological sex at birth, race, perceived susceptibility, perceived behavioral control, and subjective norms. All included variables were significant at the 0.05 level. Please see Table 4.31 for the model summary and Table 4.32 for the ANOVA table. Table 4.33 shows the coefficients of the final model, which included biological sex, race, subjective norms, behavioral control, perceived susceptibility, attitudes, health consciousness scale, and gender identity.

Table 4.31 Predicting Vaccination Intention: Model Summary (N=658)

Model	R	R Squared	Adjusted R Squared	Std. Error of the Estimate
1	0.510	0.260	0.251	0.9403

Table 4.32 Predicting Vaccination Intention: ANOVA of the Model (N=658)

Model	Sum of Squares	df	Mean Square	F	Significance
Regression	199.737	8	24.967	28.237	<0.001
Residual	568.533	643	0.884		
Total	768.270	651			

Table 4.33 Predicting Vaccination Intention: Coefficients of the Model (N=658)

	Unstandardized B	**Coefficients Std. Error**	**Standardized Coefficients Beta**	**t**	**Sig.**
(Constant)	-0.137	0.229		-0.600	0.549
Biological Sex	0.146	0.083	0.067	1.756	0.080
Race	0.034	0.018	0.064	1.860	0.063
Subjective Norms	0.252	0.059	0.186	4.246	<0.001
Behavioral Control	0.167	0.050	0.154	3.351	<0.001
Perceived Susceptibility	0.145	0.049	0.120	2.982	0.003
Health Consciousness	0.184	0.048	0.144	3.801	<0.001
Attitudes	0.098	0.050	0.082	1.939	0.053
Gender Identity	0.024	0.027	0.033	0.879	0.380

RQ5: Differences Between Groups According to Vaccination Status

Research question 5 aimed to answer whether those that had completed the HPV vaccine series were different than those that had either never started the series or had partially completed the series. Do personal characteristics and/or demographics make a difference when it relates to HPV vaccination uptake? All participants, regardless of vaccination status, were asked to answer questions related to attitudes, perceived benefits, perceived susceptibility, perceived severity, subjective norms, and knowledge related to HPV and the HPV vaccine. An ANOVA revealed that mean scores across all of the above continuous variables were significantly different between those that were fully vaccinated, partially vaccinated, and never vaccinated for HPV. Those that were fully

vaccinated had the highest mean scores on all variables, followed by those partially vaccinated with the second highest mean scores. Those that had never been vaccinated had the lowest mean scores across all variables.

When looking at categorical demographic variables, a chi-square analysis revealed that there were no significant differences between the groups relating to sexual orientation, relationship status, sexual activity within the last three months (number of partners), use of STD/STI protection, race, and highest level of education completed. However, there were differences between the groups when looking at sexual activity (yes or no), area one grew up in, how one would describe oneself (man, woman, trans, etc.), religion, and political affiliation.

Table 4.34 Mean Scores According to Vaccination Status (N=780)

Vaccination Status	**Attitudes** Mean (SD)	**Subjective Norms** Mean (SD)	**Perceived Susceptibility** Mean (SD)	**Perceived Severity** Mean (SD)	**Perceived Benefits** Mean (SD)	**Sum Knowledge** Mean (SD)
Complete (n=122)	3.947 (1.007)	3.440 (0.878)	3.086 (0.924)	3.861 (1.033)	3.798 (0.996)	13.336 (7.161)
Partial (n=207)	3.516 (1.001)	3.318 (0.830)	3.081 (0.825)	3.584 (0.976)	3.601 (0.930)	12.947 (6.227)
None (n=451)	3.340 (0.862)	3.096 (0.750)	2.846 (0.896)	3.505 (1.017)	3.483 (0.922)	8.142 (7.026)

Table 4.35 Mean Scores According to Vaccination Status: ANOVA table (N=780)

Factor		**Sum of Squares**	**df**	**Mean Square**	**F**	**Significance**
Attitudes	Between Groups	35.702	2	17.851	20.892	<0.001
	Within Groups	663.903	777	0.854		
	Total	699.605	779			
Subjective Norms	Between Groups	41.659	2	20.830	33.134	<0.001
	Within Groups	488.458	777	0.629		
	Total	530.117	779			
Perceived Susceptibility	Between Groups	31.928	2	15.964	20.522	<0.001
	Within Groups	604.431	777	0.778		
	Total	636.359	779			
Perceived Severity	Between Groups	24.544	2	12.272	12.051	<0.001
	Within Groups	791.239	777	1.018		

	Total	815.783	779			
Perceived Benefits	Between Groups	23.823	2	11.912	13.597	<0.001
	Within Groups	680.706	777	0.876		
	Total	704.530	779			
Knowledge	Between Groups	4671.367	2	2335.684	49.846	<0.001
	Within Groups	36408.555	777	46.858		
	Total	41079.922	779			

Table 4.36 Sexual Orientation by Vaccination Status (N=780**)**

Selected Choice		**Vaxstatus = Completely Vaccinated**	**Vaxstatus = Partially Vaccinated**	**Vaxstatus = Not Vaccinated**	**Total**
Heterosexual	Count	74	141	284	499
	% within selected choice	14.8%	28.3%	56.9%	100.0%
	% within vaxstatus	60.7%	68.1%	63.0%	64.0%
	% of total	9.5%	18.1%	36.4%	64.0%
Homosexual	Count	6	13	30	49
	% within selected choice	12.2%	26.5%	61.2%	100.0%
	% within vaxstatus	4.9%	6.3%	6.7%	6.3%
	% of total	0.8%	1.7%	3.8%	6.3%
Bisexual	Count	29	44	87	160
	% within selected choice	18.1%	27.5%	54.4%	100.0%
	% within vaxstatus	23.8%	21.3%	19.3%	20.5%
	% of total	3.7%	5.6%	11.2%	20.5%
Asexual	Count	3	2	21	26
	% within selected choice	11.5%	7.7%	80.8%	100.0%
	% within vaxstatus	2.5%	1.0%	4.7%	3.3%
	% of total	0.4%	0.3%	2.7%	3.3%

Other	Count	10	7	29	46
	% within selected choice	21.7%	15.2%	63.0%	100.0%
	% within vaxstatus	8.2%	3.4%	6.4%	5.9%
	% of total	1.3%	0.9%	3.7%	5.9%
Total	Count	122	207	451	780
	% within selected choice	15.6%	26.5%	57.8%	100.0%
	% within vaxstatus	100.0%	100.0%	100.0%	100.0%
	% of total	15.6%	26.5%	57.8%	100.0%

Table 4.37 Sexual Orientation by Vaccination Status: Chi-Square (N=780)

	Value	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	3.025	2	0.220
Likelihood Ratio	2.990	2	0.224
Linear-by-Linear Association	0.003	1	0.955
N of Valid Cases	354		

Table 4.38 Gender Identity by Vaccination Status (N=780)

Selected Choice		**Vaxstatus = Fully Vaccinated**	**Vaxstatus = Partially Vaccinated**	**Vaxstatus = Not Vaccinated**	**Total**
Man	Count	39	81	218	338
	% within selected choice	11.5%	24.0%	64.5%	100.0%
	% within vaxstatus	32.0%	39.1%	48.3%	43.3%
	% of total	5.0%	10.4%	27.9%	43.3%

Woman	Count	65	103	179	347
	% within selected choice	18.7%	29.7%	51.6%	100.0%
	% within vaxstatus	53.3%	49.8%	39.7%	44.5%
	% of total	8.3%	13.2%	22.9%	44.5%
Trans man	Count	4	7	11	22
	% within selected choice	18.2%	31.8%	50.0%	100.0%
	% within vaxstatus	3.3%	3.4%	2.4%	2.8%
	% of total	0.5%	0.9%	1.4%	2.8%
Trans woman	Count	0	2	4	6
	% within selected choice	0.0%	33.3%	66.7%	100.0%
	% within vaxstatus	0.0%	1.0%	0.9%	0.8%
	% of total	0.0%	0.3%	0.5%	0.8%
Non-binary	Count	14	12	33	59
	% within selected choice	23.7%	20.3%	55.9%	100.0%
	% within vaxstatus	11.5%	5.8%	7.3%	7.6%
	% of total	1.8%	1.5%	4.2%	7.6%
Other	Count	0	2	6	8
	% within selected choice	0.0%	25.0%	75.0%	100.0%
	% within vaxstatus	0.0%	1.0%	1.3%	1.0%
	% of total	0.0%	0.3%	0.8%	1.0%
Total	Count	122	207	451	780
	% within selected choice	15.6%	26.5%	57.8%	100.0%
	% within vaxstatus	100.0%	100.0%	100.0%	100.0%
	% of total	15.6%	26.5%	57.8%	100.0%

Table 4.39 Gender Identity by Vaccination Status: Chi-Square (N=780)

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	13.706	4	0.008
Likelihood Ratio	13.885	4	0.008
Linear-by-Linear Association	2.686	1	0.101
N of Valid Cases	780		

Table 4.40 Relationship Status by Vaccination Status (N=780)

Selected Choice		Vaxstatus = Fully Vaccinated	Vaxstatus = Partially Vaccinated	Vaxstatus = Not Vaccinated	Total
Single	Count	71	129	302	502
	% within selected choice	14.1%	25.7%	60.2%	100.0%
	% within vaxstatus	58.2%	62.3%	67.0%	64.4%
	% of total	9.1%	16.5%	38.7%	64.4%
Dating someone	Count	42	54	113	209
	% within selected choice	20.1%	25.8%	54.1%	100.0%
	% within vaxstatus	34.4%	26.1%	25.1%	26.8%
	% of total	5.4%	6.9%	14.5%	26.8%
Married	Count	9	22	35	66
	% within selected choice	13.6%	33.3%	53.0%	100.0%
	% within vaxstatus	7.4%	10.6%	7.8%	8.5%
	% of total	1.2%	2.8%	4.5%	8.5%
Divorced	Count	0	2	1	3
	% within selected choice	0.0%	66.7%	33.3%	100.0%

	% within vaxstatus	0.0%	1.0%	0.2%	0.4%
	% of total	0.0%	0.3%	0.1%	0.4%
Total	Count	122	207	451	780
	% within selected choice	15.6%	26.5%	57.8%	100.0%
	% within vaxstatus	100.0%	100.0%	100.0%	100.0%
	% of total	15.6%	26.5%	57.8%	100.0%

Table 4.41 Relationship Status by Vaccination Status: Chi-Square (N=780)

	Value	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	8.709	6	0.191
Likelihood Ratio	8.429	6	0.208
Linear-by-Linear Association	2.447	1	0.118
N of Valid Cases	780		

Table 4.42 Sexual Activity by Vaccination Status (N=780)

Selected Choice		**Vaxstatus = Fully Vaccinated**	**Vaxstatus = Partially Vaccinated**	**Vaxstatus = Not Vaccinated**	**Total**
Yes	Count	60	111	183.	354
	% within selected choice	16.9%	31.4%	51.7%	100.0%
	% within vaxstatus	49.2%	53.6%	40.6%	45.4%
	% of total	7.7%	14.2%	23.5%	45.4%
No	Count	37	62	209	308
	% within	12.0%	20.1%	67.9%	100.0%

	selected choice				
	% within vaxstatus	30.3%	30.0%	46.3%	39.5%
	% of total	4.7%	7.9%	26.8%	39.5%
Not at the time, but have been in the past	Count	25	34	59	118
	% within selected choice	21.2%	28.8%	50.0%	100.0%
	% within vaxstatus	20.5%	16.4%	13.1%	15.1%
	% of total	3.2%	4.4%	7.6%	15.1%
Total	Count	122	207	451	780
	% within selected choice	15.6%	26.5%	57.8%	100.0%
	% within vaxstatus	100.0%	100.0%	100.0%	100.0%
	% of total	15.6%	26.5%	57.8%	100.0%

Table 4.43 Sexual Activity by Vaccination Status: Chi-Square (N=780)

	Value	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	22.303	4	<0.001
Likelihood Ratio	22.406	4	<0.001
Linear-by-Linear Association	0.498	1	0.480
N of Valid Cases	780		

Table 4.44 Sexual Partners by Vaccination Status (N=780)

Selected Choice		Vaxstatus = Fully Vaccinated	Vaxstatus = Partially Vaccinated	Vaxstatus = Not Vaccinated	Total
I had sex with one partner over the past 3 months	Count	54	90	159	303
	% within selected choice	17.8%	29.7%	52.5%	100.0%
	% within vaxstatus	90.0%	81.1%	86.9%	85.6%
	% of total	15.3%	25.4%	44.9%	85.6%
I had sex with multiple partners over the past 3 months	Count	6	21	24	51
	% within selected choice	11.8%	41.2%	47.1%	100.0%
	% within vaxstatus	10.0%	18.9%	13.1%	14.4%
	% of total	1.7%	5.9%	6.8%	14.4%
Total	Count	60	111	183	354
	% within selected choice	16.9%	31.4%	51.7%	100.0%
	% within vaxstatus	100.0%	100.0%	100.0%	100.0%
	% of total	16.9%	31.4%	51.7%	100.0%

Table 4.45 Sexual Partners by Vaccination Status: Chi-Square (N=780)

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.025	2	0.220
Likelihood Ratio	2.990	2	0.224
Linear-by-Linear Association	0.003	1	0.955
N of Valid Cases	354		

Table 4.46 Religion by Vaccination Status (N=780)

Selected Choice		Vaxstatus = Fully Vaccinated	Vaxstatus = Partially Vaccinated	Vaxstatus = Not Vaccinated	Total
Yes	Count	49	100	167	316
	% within selected choice	15.5%	31.6%	52.8%	100.0%
	% within vaxstatus	40.2%	48.3%	37.0%	40.5%
	% of total	6.3%	12.8%	21.4%	40.5%
No	Count	73	107	284	464
	% within selected choice	15.7%	23.1%	61.2%	100.0%
	% within vaxstatus	59.8%	51.7%	63.0%	59.5%
	% of total	9.4%	13.7%	36.4%	59.5%
Total	Count	122	207	151	780
	% within selected choice	15.6%	26.5%	57.8%	100.0%
	% within vaxstatus	100.0%	100.0%	100.0%	100.0%
	% of total	15.6%	26.5%	57.8%	100.0%

Table 4.47 Religion by Vaccination Status: Chi-Square (N=780)

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	7.498	2	0.024
Likelihood Ratio	7.438	2	0.024
Linear-by-Linear Association	2.230	1	0.135
N of Valid Cases	780		

Table 4.48 STI Protection Use by Vaccination Status (N=780)

Selected Choice		Vaxstatus = Fully Vaccinated	Vaxstatus = Partially Vaccinated	Vaxstatus = Not Vaccinated	Total
Always	Count	38	53	66	157
	% within selected choice	24.2%	33.8%	42.0%	100.0%
	% within vaxstatus	44.7%	36.6%	27.3%	33.3%
	% of total	8.1%	11.2%	14.0%	33.3%
Usually	Count	13	31	54	98
	% within selected choice	13.3%	31.6%	55.1%	100.0%
	% within vaxstatus	15.3%	21.4%	22.3%	20.8%
	% of total	2.8%	6.6%	11.4%	20.8%
Almost half the time	Count	8	22	31	61
	% within selected choice	13.1%	36.1%	50.8%	100.0%
	% within vaxstatus	9.4%	15.2%	12.8%	12.9%
	% of total	1.7%	4.7%	6.6%	12.9%
Seldom	Count	9	8	22	39
	% within selected choice	23.1%	20.5%	56.4%	100.0%
	% within vaxstatus	10.6%	5.5%	9.1%	8.3%
	% of total	1.9%	1.7%	4.7%	8.3%
Never	Count	17	31	69	117
	% within selected choice	14.5%	26.5%	59.0%	100.0%
	% within vaxstatus	20.0%	21.4%	28.5%	24.8%
	% of total	3.6%	6.6%	14.6%	24.8%
Total	Count	85	145	242	472
	% within selected choice	18.0%	30.7%	51.3%	100.0%
	% within vaxstatus	100.0%	100.0%	100.0%	100.0%
	% of total	18.0%	30.7%	51.3%	100.0%

Table 4.49 STI Protection Use by Vaccination Status: Chi-Square (N=780)

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	14.240	8	0.076
Likelihood Ratio	14.393	8	0.072
Linear-by-Linear Association	6.308	1	0.012
N of Valid Cases	472		

Table 4.50 Rurality by Vaccination Status (N=780)

Selected Choice		Vaxstatus = Fully Vaccinated	Vaxstatus = Partially Vaccinated	Vaxstatus = Not Vaccinated	Total
Urban	Count	45	71	124	240
	% within selected choice	18.8%	29.6%	51.7%	100.0%
	% within vaxstatus	36.9%	34.3%	27.5%	30.8%
	% of total	5.8%	9.1%	15.9%	30.8%
Suburban	Count	62	94	197	353
	% within selected choice	17.6%	26.6%	55.8%	100.0%
	% within vaxstatus	50.8%	45.4%	43.7%	45.3%
	% of total	7.9%	12.1%	25.3%	45.3%
Rural	Count	10	31	81	122
	% within selected choice	8.2%	25.4%	66.4%	100.0%
	% within vaxstatus	8.2%	15.0%	18.0%	15.6%
	% of total	1.3%	4.0%	10.4%	15.6%
Not sure	Count	5	11	49	65
	% within selected choice	7.7%	16.9%	75.4%	100.0%
	% within vaxstatus	4.1%	5.3%	10.9%	8.3%
	% of total	0.6%	1.4%	6.3%	8.3%

Total	Count	122	207	451	780
	% within selected choice	15.6%	26.5%	57.8%	100.0%
	% within vaxstatus	100.0%	100.0%	100.0%	100.0%
	% of total	15.6%	26.5%	57.8%	100.0%

Table 4.51 Rurality by Vaccination Status: Chi-Square (N=780)

	Value	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	19.266	6	0.004
Likelihood Ratio	20.666	6	0.002
Linear-by-Linear Association	16.202	1	<0.001
N of Valid Cases	472		

Table 4.52 Highest Level of Education Completed by Vaccination Status (N=780)

Selected Choice		**Vaxstatus = Fully Vaccinated**	**Vaxstatus = Partially Vaccinated**	**Vaxstatus = Not Vaccinated**	**Total**
Some high school	Count	11	15	39	65
	% within selected choice	16.9%	23.1%	60.0%	100.0%
	% within vaxstatus	9.0%	7.2%	8.6%	8.3%
	% of total	1.4%	1.9%	5.0%	8.3%
High school diploma or GED	Count	35	49	146	230
	% within selected choice	15.2%	21.3%	63.5%	100.0%
	% within vaxstatus	28.7%	23.7%	32.4%	29.5%
	% of total	4.5%	6.3%	18.7%	29.5%

Some college	Count	38	61	127	226
	% within selected choice	16.8%	27.0%	56.2%	100.0%
	% within vaxstatus	31.1%	29.5%	28.2%	29.0%
	% of total	4.9%	7.8%	16.3%	29.0%
Masters or other graduate degree	Count	5	27	33	65
	% within selected choice	7.7%	41.5%	50.8%	100.0%
	% within vaxstatus	4.1%	13.0%	7.3%	8.3%
	% of total	0.6%	3.5%	4.2%	8.3%
Did not complete high school	Count	2	1	6	9
	% within selected choice	22.2%	11.1%	66.7%	100.0%
	% within vaxstatus	1.6%	0.5%	1.3%	1.2%
	% of total	0.3%	0.1%	0.8%	21.2%
Total	Count	122	207	451	780
	% within selected choice	15.6%	26.5%	57.8%	100.0%
	% within vaxstatus	100.0%	100.0%	100.0%	100.0%
	% of total	15.6%	26.5%	57.8%	100.0%

Table 4.53 Highest Level of Education Completed by Vaccination Status: Chi-Square (N=780)

	Value	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	15.373	10	0.119
Likelihood Ratio	15.517	10	0.114
Linear-by-Linear Association	0.887	1	0.346
N of Valid Cases	780		

Table 4.54 Race by Vaccination Status (N=780)

Selected Choice		Vaxstatus = Fully Vaccinated	Vaxstatus = Partially Vaccinated	Vaxstatus = Not Vaccinated	Total
White	Count	86	124	245	455
	% within selected choice	18.9%	27.3%	53.8%	100.0%
	% within vaxstatus	70.5%	59.9%	54.3%	58.3%
	% of total	11.0%	15.9%	31.4%	58.3%
Black or African American	Count	22	42	93	157
	% within selected choice	14.0%	26.8%	59.2%	100.0%
	% within vaxstatus	18.0%	20.3%	20.6%	20.1%
	% of total	2.8%	5.4%	11.9%	20.1%
Other	Count	14	41	113	168
	% within selected choice	8.3%	24.4%	67.3%	100.0%
	% within vaxstatus	11.5%	19.38%	25.1%	21.5%
	% of total	1.8%	5.3%	14.5%	21.5%
Total	Count	122	207	451	780
	% within selected choice	15.6%	26.5%	57.8%	100.0%
	% within vaxstatus	100.0%	100.0%	100.0%	100.0%
	% of total	15.6%	26.5%	57.8%	100.0%

Table 4.55 Race by Vaccination Status: Chi-Square (N=780)

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	13.360	4	0.010
Likelihood Ratio	14.268	4	0.006
Linear-by-Linear	12.315	1	<0.001

Association			
N of Valid Cases	780		

Table 4.56 Political Affiliation by Vaccination Status (N=780)

Selected Choice		Vaxstatus = Fully Vaccinated	Vaxstatus = Partially Vaccinated	Vaxstatus = Not Vaccinated	Total
Republican	Count	21	31	74	126
	% within selected choice	16.7%	24.6%	58.7%	100.0%
	% within vaxstatus	17.2%	15.0%	16.4%	16.2%
	% of total	2.7%	4.0%	9.5%	16.2%
Democrat	Count	61	105	167	333
	% within selected choice	18.3%	31.5%	50.2%	100.0%
	% within vaxstatus	50.0%	50.7%	37.0%	42.7%
	% of total	7.8%	13.5%	21.4%	42.7%
Independent	Count	26	44	104	174
	% within selected choice	14.9%	25.3%	59.8%	100.0%
	% within vaxstatus	21.3%	21.3%	23.2%	22.3%
	% of total	3.3%	5.6%	13.3%	22.3%
No preference	Count	14	27	106	147
	% within selected choice	9.5%	18.4%	72.1%	100.0%
	% within vaxstatus	11.5%	13.0%	23.5%	18.8%
	% of total	1.8%	3.5%	13.6%	18.8%
Total	Count	122	207	451	780
	% within selected choice	15.6%	26.5%	57.8%	100.0%
	% within vaxstatus	100.0%	100.0%	100.0%	100.0%
	% of total	15.6%	26.5%	57.8%	100.0%

Table 4.57 Political Affiliation by Vaccination Status: Chi-Square (N=780)

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	21.000	6	.002
Likelihood Ratio	21.552	6	0.001
Linear-by-Linear Association	10.190	1	0.001
N of Valid Cases	780		

Table 4.58 HPV Vaccine Recommendation by Vaccination Status (N=780)

Selected Choice		Vaxstatus = Fully Vaccinated	Vaxstatus = Partially Vaccinated	Vaxstatus = Not Vaccinated	Total
Yes	Count	105	162	112	379
	% within selected choice	27.7%	42.7%	29.6%	100.0%
	% within vaxstatus	86.1%	78.3%	24.8%	48.6%
	% of total	13.5%	20.8%	14.4%	48.6%
No	Count	17	45	339	401
	% within selected choice	4.2%	11.2%	84%	100.0%
	% within vaxstatus	13.9%	21.7%	75.2%	51.4%
	% of total	2.2%	5.8%	43.5%	51.4%
	% of total	1.8%	5.3%	14.5%	21.5%
Total	Count	122	207	451	780
	% within selected choice	15.6%	26.5%	57.8%	100.0%
	% within vaxstatus	100.0%	100.0%	100.0%	100.0%
	% of total	15.6%	26.5%	57.8%	100.0%

Table 4.59 HPV Vaccine Recommendation by Vaccination Status: Chi-Square (N=780)

	Value	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	243.434	2	<0.001
Likelihood Ratio	259.832	2	<0.001
Linear-by-Linear Association	215.139	1	<0.001
N of Valid Cases	780		

RQ6 Segmentation Analysis

Segmentation was done using a hierarchical clustering approach. A four segment solution was originally hypothesized, with knowledge, hesitancy, risk perception, and help making decisions being the primary themes of the segments. Based upon this hypothesis and literature on the topic, several variables were tested in creating potential segments. Variables included: attitudes, subjective norms, behavioral intentions, perceived behavioral control, perceived benefits, perceived susceptibility, perceived severity, self-efficacy, cues to action, and perceived barriers. A range of three to six segments was evaluated with each new variable combination. The goal was to find a segment solution that was parsimonious--where segments could be described individually, were meaningfully different from one another, and had unique wants and needs in relation to intentions to receive the HPV vaccine. Based upon this goal, the final segmenting variables were attitudes, subjective norms, perceived susceptibility, and knowledge. These four segmenting variables resulted in a six segment solution. In addition to ensuring that a segment solution makes sense logically, it is helpful to compute the R^2 (between cluster variation/total variation) of each segment. A higher R^2 value is preferred, but if the incremental difference between segments is less than 0.05, reverting to a smaller segment size can be considered. For this segmentation analysis, when looking at a six, five, or four segment solution, incremental differences between the segments were less than 0.05, but it made more sense to keep the six segments versus five or four segments. The six segment solution had sizeable segments, apart from the tiny fourth segment, and had an acceptable amount of variation between them. Plus, when

describing the six segments, it was apparent that there were differences between each segment with each segment having its own unique wants and needs.

Table 4.60 Segment Frequency Table

Segment	Frequency	%
1	139	21.1
2	179	27.2
3	104	15.8
4	8	1.2
5	87	13.2
6	141	21.4
Total	658	100%

Table 4.61 Segment ANOVA Table on Segmenting Variables

		Sum of Squares	**df**	**Mean Square**	**F**	**Significance**
Attitudes	Between Groups	52.543	5	10.509	13.898	<0.001
	Within Groups	492.972	652	0.756		
	Total	545.514	657			
Subjective Norms	Between Groups	23.381	5	4.676	7.692	<0.001
	Within Groups	396.389	652	0.608		
	Total	419.770	657			
Perceived Susceptibility	Between Groups	31.385	5	6.277	8.294	<0.001
	Within Groups	493.432	652	0.757		
	Total	524.817	657			
Knowledge	Between Groups	32183.191	5	6436.638	3238.670	0.000
	Within Groups	1295.806	652	1.987		
	Total	33478.997	657			

Table 4.62 Segment Mean Scores on Segmenting Variables (N=658)

Segment	**Attitudes** Mean (SD)	**Subjective norms** Mean (SD)	**Perceived susceptibility** Mean (SD)	**Sum knowledge score** Mean (SD)
1 (N=139)	3.493 (0.967)	3.243 (0.756)	2.961 (0.695)	14.791 (1.539)
2 (N=179)	3.233 (0.863)	3.027 (0.696)	2.876 (0.753)	9.358 (1.740)
3 (N=104)	3.832 (1.020)	3.183 (1.030)	3.0395 (1.146)	19.914 (1.495)
4 (N=8)	4.688 (0.594)	3.146 (0.594)	2.694 (0.942)	25.000 (1.069)
5	3.428 (0.667)	3.042 (0.658)	2.737 (0.856)	3.667 (1.353)

(N=87)				
6 (N=141)	3.089 (0.772)	2.709 (0.768)	2.420 (0.932)	0.219 (0.494)
Bonferroni Post Hoc	1 & 3, 1 & 4, 1 & 6, 2 & 3, 2 & 4, 3 & 5, 3 & 6, 4 & 5, 4 & 6	1 & 6, 2 & 6, 3 & 6, 5 & 6	1 & 6, 2 & 6, 3 & 6	1 & 2, 1 & 3, 1 & 4, 1 & 5, 1 & 6, 2 & 3, 2 & 4, 2 & 5, 2 & 6, 3 & 4, 3 & 5, 3 & 6, 4 & 5, 4 & 6, 5 & 6

Table 4.63 Segment Characteristics: Mean Barriers (N=658)

Segment	**Mean Barriers** Mean (SD)	**Vax Belief Barriers** Mean (SD)	**Safety Barriers** Mean (SD)	**Access Barriers** Mean (SD)	**Risk Barriers** Mean (SD)	**Time Barriers** Mean (SD)
1 (N=139)	3.008 (0.650)	2.786 (0.934)	3.128 (0.932)	3.078 (0.826)	3.201 (0.978)	3.108 (0.993)
2 (N=179)	3.056 (0.561)	2.829 (0.772)	3.228 (0.874)	3.124 (0.671)	3.265 (0.979)	3.078 (0.896)
3 (N=104)	2.974 (0.858)	2.684 (0.960)	3.308 (1.134)	2.948 (1.085)	3.178 (1.209)	3.115 (1.139)
4 (N=8)	2.675 (0.461)	2.234 (1.127)	3.075 (0.821)	2.643 (0.687)	2.125 (0.876)	3.625 (0.899)
5 (N=87)	3.068 (0.475)	2.881 (0.719)	3.251 (0.748)	3.120 (0.707)	3.287 (0.917)	2.992 (0.747)
6 (N=141)	2.950 (0.708)	2.811 (0.810)	3.101 (0.867)	2.977 (0.774)	3.050 (1.029)	2.943 (0.870)

Table 4.64 Segment Characteristics: Main Constructs (N=658)

Segment	**Perceived Behavioral Control**	**Self-Efficacy**	**Perceived Severity**	**Perceived Benefits**	**Baseline Intentions**
1 (N=139)	3.739 (0.956)	3.455 (0.867)	3.531 (1.004)	3.493 (0.904)	3.095 (1.057)
2 (N=179)	3.323 (0.914)	3.048 (0.886)	3.396 (0.920)	3.328 (0.865)	2.829 (0.963)
3 (N=104)	3.805 (1.086)	3.615 (1.00)	3.873 (1.103)	3.958 (0.991)	3.252 (1.244)
4 (N=8)	4.687 (0.417)	3.750 (1.551)	4.729 (0.308)	4.400 (0.950)	3.300 (1.614)
5 (N=87)	3.305 (0.849)	3.341 (0.775)	3.312 (0.960)	3.306 (0.736)	2.949 (0.993)
6 (N=141)	2.975 (0.922)	2.957 (0.894)	3.090 (0.927)	3.102 (0.903)	2.682 (1.076)

Table 4.65 Segment Demographics: Race (N=658)

		Segment 1 (N=139)	**Segment 2** (N=179)	**Segment 3** (N=104)	**Segment 4** (N=8)	**Segment 5** (N=87)	**Segment 6** (N=141)	**Total** (N=658)
White	Count	78	92	60	6	50	83	369
	% within selected choice	21.1%	24.9%	16.3%	1.6%	13.6%	22.5%	100.0%
	% within (between groups)	56.1%	51.4%	57.7%	75.0%	57.5%	58.9%	56.1%
	% of total	11.9%	14.0%	9.1%	0.9%	7.6%	12.6%	56.1%

Black or African American	Count	34	45	16	1	13	26	135
	% within selected choice	25.2%	33.3%	11.9%	0.7%	9.6%	19.3%	100.0%
	% within (between groups)	24.5%	25.1%	15.4%	12.5%	14.9%	18.4%	20.5%
	% of total	5.2%	6.8%	2.4%	0.2%	2.0%	4.0%	20.5%
American Indian or Alaskan Native	Count	4	6	4	0	3	2	19
	% within selected choice	21.1%	31.6%	21.1%	0.0%	15.8%	10.5%	100.0%
	% within (between groups)	2.9%	3.4%	3.8%	0.0%	3.4%	1.4%	2.9%
	% of total	0.6%	0.9%	0.6%	0.0%	0.5%	0.3%	2.9%
Asian	Count	12	14	17	1	10	10	64
	% within selected choice	18.8%	21.9%	26.6%	1.6%	15.6%	15.6%	100.0%
	% within (between groups)	8.6%	7.8%	16.3%	12.5%	11.5%	7.1%	9.7%
	% of total	1.8%	2.1%	2.6%	0.2%	1.5%	1.5%	9.7%
Native Hawaiian or Pacific Islander	Count	1	4	1	0	0	3	9
	% within selected choice	11.1%	44.4%	11.1%	0.0%	0.0%	33.3%	100.0%
	% within (between	0.7%	2.2%	1.0%	0.0%	0.0%	2.1%	1.4%

	groups)							
	% of total	0.2%	0.6%	0.2%	0.0%	0.0%	0.5%	1.4%
Other	Count	10	18	6	0	11	17	62
	% within selected choice	16.1%	29.0%	9.7%	0.0%	17.7%	27.4%	100.0%
	% within (between groups)	7.2%	10.1%	5.8%	0.0%	12.6%	12.1%	9.4%
	% of total	1.5%	2.7%	0.9%	0.0%	1.7%	2.6%	9.4%

Table 4.66 Segment Demographics: Sexual Orientation (N=658)

		Segment 1 (N=139)	**Segment 2** (N=179)	**Segment 3** (N=104)	**Segment 4** (N=8)	**Segment 5** (N=87)	**Segment 6** (N=141)	**Total** (N=658)
Heterosexual	Count	94	105	75	5	53	93.	425
	% within selected choice	22.1%	24.7%	17.6%	1.2%	12.5%	21.9%	100.0%
	% within (between groups)	67.6%	58.7%	72.1%	62.5%	60.9%	66.0%	64.6%
	% of total	14.3%	16.0%	11.4%	0.8%	8.1%	14.1%	64.6%
Homosexual	Count	13	14	4	0	6	6	43
	% within selected choice	30.2%	32.6%	9.3%	0.0%	14.0%	14.0%	100.0%

	% within (between groups)	9.4%	7.8%	3.8%	0.0%	6.9%	4.3%	6.5%
	% of total	2.0%	2.1%	0.6%	0.0%	0.9%	0.9%	6.5%
Bisexual	Count	24	47	19	3	18	20	131
	% within selected choice	18.3%	35.9%	14.5%	2.3%	13.7%	15.3%	100.0%
	% within (between groups)	17.3%	26.3%	18.3%	37.5%	20.7%	14.2%	19.9%
	% of total	3.6%	7.1%	2.9%	0.5%	2.7%	3.0%	19.9%
Asexual	Count	3	7	3	0	5	5	23
	% within selected choice	13.0%	30.4%	13.0%	0.0%	21.7%	21.7%	100.0%
	% within (between groups)	2.2%	3.9%	2.9%	0.0%	5.7%	3.5%	3.5%
	% of total	0.5%	1.1%	0.5%	0.0%	0.8%	0.8%	3.5%
Other	Count	5	6	3	0	5	17	36
	% within selected choice	13.9%	16.7%	8.3%	0.0%	13.9%	47.2%	100.0%
	% within (between groups)	3.6%	3.4%	2.9%	0.0%	5.7%	12.1%	5.5%
	% of total	0.8%	0.9%	0.5%	0.0%	0.8%	2.6%	5.5%

Table 4.67 Segment Demographics: Relationship Status (N=658)

		Segment 1 (N=139)	**Segment 2** (N=179)	**Segment 3** (N=104)	**Segment 4** (N=8)	**Segment 5** (N=87)	**Segment 6** (N=141)	**Total** (N=658)
Single	Count	87	119	61	5	57	102	431
	% within selected choice	20.2%	27.6%	14.2%	1.2%	13.2%	23.7%	100.0%
	% within (between groups)	62.6%	66.5%	58.7%	62.5%	65.5%	72.3%	65.5%
	% of total	13.2%	18.1%	9.3%	0.8%	8.7%	15.5%	65.5%
Dating	Count	38	46	21	2	26	28	167
	% within selected choice	22.8%	27.5%	16.2%	1.2%	15.6%	16.8%	100.0%
	% within (between groups)	27.3%	25.7%	26.0%	25.0%	29.9%	19.9%	25.4%
	% of total	5.8%	7.0%	4.1%	0.3%	4.0%	4.3%	25.4%
Married	Count	14	12	15	1	4	11	57
	% within selected choice	24.6%	21.1%	26.3%	1.8%	7.0%	19.3%	100.0%
	% within (between groups)	10.1%	6.7%	14.4%	12.5%	4.6%	7.8%	8.7%
	% of total	2.1%	1.8%	2.3%	0.2%	0.6%	1.7%	8.7%
Divorced	Count	0	2	1	0	0	0	3
	% within	0.0%	66.7%	33.3%	0.0%	0.0%	0.0%	100.0%

	selected choice							
	% within (between groups)	0.0%	1.1%	1.0%	0.0%	0.0%	0.0%	0.5%
	% total	0.0%	0.3%	0.2%	0.0%	0.0%	0.0%	0.5%

Table 4.68 Segment Demographics: Sexual Activity (N=658)

		Segment 1 (N=139)	**Segment 2** (N=179)	**Segment 3** (N=104)	**Segment 4** (N=8)	**Segment 5** (N=87)	**Segment 6** (N=104)	**Total** (N=658)
Yes	Count	74	79	54	6	30	51	294
	% within selected choice	25.2%	26.9%	18.4%	2.0%	10.2%	17.3%	100.0%
	% within (between groups)	53.2%	44.1%	51.9%	75.0%	34.5%	36.2%	44.7%
	% of total	11.2%	12.0%	8.2%	0.9%	4.6%	7.8%	44.7%
No	Count	49	66	40	1	45	70	271
	% within selected choice	18.1%	24.4%	14.8%	0.4%	16.6%	25.8%	100.0%
	% within (between groups)	35.3%	36.9%	38.5%	12.5%	51.7%	49.6%	41.2%
	% of total	7.4%	10.0%	6.1%	0.2%	6.8%	10.6%	41.2%
Not at the time, but	Count	16	34	10	1	12	20	93.
	% within	17.2%	36.6%	10.8%	1.1%	12.9%	21.5%	100.0%

have been in the past	selected choice							
	% within (between groups)	11.5%	19.0%	9.6%	12.5%	13.8%	14.2%	14.1%
	% of total	2.4%	5.2%	1.5%	0.2%	1.8%	3.0%	14.1%

Table 4.69 Segment Demographics: Rurality (N=658)

		Segment 1 (N=139)	**Segment 2** (N=179)	**Segment 3** (N=104)	**Segment 4** (N=8)	**Segment 5** (N=87)	**Segment 6** (N=141)	**Total** (N=658)
Urban	Count	47	55	40	1	25	27	195
	% within selected choice	24.1%	28.2%	20.5%	0.5%	12.8%	13.8%	100.0%
	% within (between groups)	33.8%	30.7%	38.5%	12.5%	28.7%	19.1%	29.6%
	% of total	7.1%	8.4%	6.1%	0.2%	3.8%	4.1%	29.6%
Suburban	Count	72	78	45	5	32	59	291
	% within selected choice	24.7%	26.8%	15.5%	1.7%	11.0%	20.3%	100.0%
	% within (between groups)	51.8%	43.6%	43.3%	62.5%	36.8%	41.8%	44.2%
	% of total	10.9%	11.9%	6.8%	0.8%	4.9%	9.0%	44.2%
Rural	Count	16	25	17	2	20	32	112
	% within	14.3%	22.3%	15.2%	1.8%	17.9%	28.6%	100.0%

	selected choice							
	% within (between groups)	11.5%	14.0%	16.3%	25.0%	23.0%	22.7%	17.0%
	% of total	2.4%	3.8%	2.6%	0.3%	3.0%	4.9%	17.0%
Not sure	Count	4	21	2	0	10	23	60
	% within selected choice	6.7%	35.0%	3.3%	0.0%	16.7%	38.3%	100.0%
	% within (between groups)	2.9%	11.7%	1.9%	0.0%	11.5%	16.3%	9.1%
	% of total	0.6%	3.2%	0.3%	0.0%	1.5%	3.5%	9.1%

Table 4.70 Segment Demographics: Education (N=658)

		Segment 1 (N=139)	**Segment 2** (N=179)	**Segment 3** (N=104)	**Segment 4** (N=8)	**Segment 5** (N=87)	**Segment 6** (N=141)	**Total** (N=658)
Some high school	Count	10	12	8	1	9	14	54
	% within selected choice	18.5%	22.2%	14.8%	1.9%	16.7%	25.9%	100.0%
	% within (between groups)	7.2%	6.7%	7.7%	12.5%	10.3%	9.9%	8.2%
	% of total	1.5%	1.8%	1.2%	0.2%	1.4%	2.1%	8.2%
High school	Count	37	53	22	0	23	60	195
	% within	19.0%	27.2%	11.3%	0.0%	11.8%	30.8%	100.0%

diploma or GED	selected choice							
	% within (between groups)	26.6%	29.6%	21.2%	0.0%	26.4%	42.6%	29.6%
	% of total	5.6%	8.1%	3.3%	0.0%	3.5%	9.1%	29.6%
Some college	Count	42	48	36	3	27	32	188
	% within selected choice	22.3%	25.5%	19.1%	1.6%	14.4%	17.0%	100.0%
	% within (between groups)	30.2%	26.8%	34.6%	37.5%	31.0%	22.7%	28.6%
	% of total	6.4%	7.3%	5.5%	0.5%	4.1%	4.9%	28.6%
College degree	Count	37	44	27	3	20	23	154
	% within selected choice	24.0%	28.6%	17.5%	1.9%	13.0%	14.9%	100.0%
	% within (between groups)	26.6%	24.6%	26.0%	37.5%	23.0%	16.3%	23.4%
	% of total	5.6%	6.7%	4.1%	0.5%	3.0%	3.5%	23.4%
Masters or other graduate degree	Count	12	20	11	1	6	10	60
	% within selected choice	20.0%	33.3%	18.3%	1.7%	10.0%	16.7%	100.0%
	% within (between groups)	8.6%	11.2%	10.6%	12.5%	6.9%	7.1%	9.1%
	% of total	1.8%	3.0%	1.7%	0.2%	0.9%	1.5%	9.1%

Did not complete high school	Count	1	2	0	0	2	2	7
	% within selected choice	14.3%	28.6%	0.0%	0.0%	28.6%	28.6%	100.0%
	% within (between groups)	0.7%	1.1%	0.0%	0.0%	2.3%	1.4%	1.1%
	% of total	0.2%	0.3%	0.0%	0.0%	0.3%	0.3%	1.1%

Table 4.71 Segment Demographics: Religion (N=658)

		Segment 1 (N=139)	**Segment 2** (N=179)	**Segment 3** (N=104)	**Segment 4** (N=8)	**Segment 5** (N=87)	**Segment 6** (N=141)	**Total** (N=658)
Yes	Count	62	75	53	2	24	51	267
	% within selected choice	23.2%	28.1%	19.9%	0.7%	9.0%	19.1%	100.0%
	% within (between groups)	44.6%	41.9%	51.0%	25.0%	27.6%	36.2%	40.6%
	% of total	9.4%	11.4%	8.1%	0.3%	3.6%	7.8%	40.6%
No	Count	77	104	51	6	63	90	391
	% within selected choice	19.7%	26.6%	13.0%	1.5%	16.1%	23.0%	100.0%
	% within (between groups)	55.4%	58.1%	49.0%	75.0%	72.4%	63.8%	59.4%
	% of total	11.7%	15.8%	7.8%	0.9%	9.6%	13.7%	59.4%

Table 4.72 Segment Demographics: Has the HPV Vaccine ever been recommended? (N=658)

		Segment 1 (N=139)	**Segment 2** (N=179)	**Segment 3** (N=104)	**Segment 4** (N=8)	**Segment 5** (N=87)	**Segment 6** (N=141)	**Total** (N=658)
Yes	Count	77	75	67	4	26	25	274
	% within selected choice	28.1%	27.4%	24.5%	1.5%	9.5%	9.1%	100.0%
	% within (between groups)	55.4%	41.9%	64.4%	50.0%	29.9%	17.7%	41.6%
	% of total	11.7%	11.4%	10.2%	0.6%	4.0%	3.8%	41.6%
No	Count	62	104	37	4	61	116	384
	% within selected choice	16.1%	27.1%	9.6%	1.0%	15.9%	30.2%	100.0%
	% within (between groups)	44.6%	58.1%	35.6%	50.0%	70.1%	82.3%	58.4%
	% of total	9.4%	15.8%	5.6%	0.6%	9.3%	17.6%	58.4%

Table 4.73 Segment Demographics: Health Insurance (N=658)

		Segment 1 (N=139)	**Segment 2** (N=179)	**Segment 3** (N=104)	**Segment 4** (N=8)	**Segment 5** (N=87)	**Segment 6** (N=141)	**Total** (N=658)
Yes	Count	126	137	94	8	64	95	524
	% within selected choice	24.0%	26.1%	17.9%	1.5%	12.2%	18.1%	100.0%
	% within	90.6%	76.5%	90.4%	100.0%	73.6%	67.4%	79.6%

	(between groups)							
	% of total	19.1%	20.8%	14.3%	1.2%	9.7%	14.4%	79.6%
No	Count	8	27	6	0	12	20	73
	% within selected choice	11.0%	37.0%	8.2%	0.0%	16.4%	27.4%	100.0%
	% within (between groups)	5.8%	15.1%	5.8%	0.0%	13.8%	14.2%	11.1%
	% of total	1.2%	4.1%	0.9%	0.0%	1.8%	3.0%	11.1%
Not anymore	Count	4	8	1	0	5	10	28
	% within selected choice	14.3%	28.6%	3.6%	0.0%	17.9%	35.7%	100.0%
	% within (between groups)	2.9%	4.5%	1.0%	0.0%	5.7%	7.1%	4.3%
	% of total	0.6%	1.2%	0.2%	0.0%	0.8%	1.5%	4.3%
Not sure	Count	1	7	3	0	6	16	33
	% within selected choice	3.0%	21.2%	9.1%	0.0%	18.2%	48.5%	100.0%
	% within (between groups)	0.7%	3.9%	2.9%	0.0%	6.9%	11.3%	5.0%
	% of total	0.2%	1.1%	0.5%	0.0%	0.9%	2.4%	5.0%

Table 4.74 Segment Demographics: Primary Care Doctor (N=658)

		Segment 1 (N=139)	**Segment 2** (N=179)	**Segment 3** (N=104)	**Segment 4** (N=8)	**Segment 5** (N=87)	**Segment 6** (N=141)	**Total** (N=658)
Yes	Count	106	122	84	6	57	85	460
	% within selected choice	23.0%	26.5%	18.3%	1.3%	12.4%	18.5%	100.0%
	% within (between groups)	76.3%	68.2%	80.8%	75.0%	65.5%	60.3%	69.9%
	% of total	16.1%	18.5%	12.8%	0.9%	8.7%	12.9%	69.9%
No	Count	33	57	20	2	30	56	198
	% within selected choice	16.7%	28.8%	10.1%	1.0%	15.2%	28.3%	100.0%
	% within (between groups)	23.7%	31.8%	19.2%	25.0%	34.5%	39.7%	30.1%
	% of total	5.0%	8.7%	3.0%	0.3%	4.6%	8.5%	30.1%

Table 4.75 R^2 Calculations

6 Segment Solution					
	Between	**df**	**Within**	**df**	**Total**
Attitudes	52.543	5	0.756	652	755.627
Knowledge	32183.191	5	1.987	652	162211.479
Suscept	31.385	5	0.757	652	650.489
Norms	23.381	5	0.608	652	513.321
Total					164130.916
R^2	0.98368122				

5 Segment Solution					
	Between	**df**	**Within**	**df**	**Total**
Attitudes	46.341	4	0.764	653	684.256
Knowledge	31543.99	4	2.963	653	128110.8
Susceptibility	25.982	4	0.764	653	602.82
Norms	17.418	4	0.616	653	471.92
Total		126534.9			129869.8
R^2	0.974321				
4 Segment Solution					
	Between	**df**	**Within**	**df**	**Total**
Attitudes	40.901	3	0.772	654	627.591
Knowledge	31351.79	3	3.253	654	96182.84
Susceptibility	25.098	3	0.764	654	574.95
Norms	17.407	3	0.615	654	454.431
Total		94305.59			97839.81
R^2	0.963878				

Segment #1: "Keeping up with the Kardashians"

This segment had the highest mean score for subjective norms. In fact, when asked about what would sway them, they rated a sexual partner's recommendation the highest (even ahead of a healthcare provider's recommendation). A family member's recommendation as well as having a personal connection to HPV were also high on the list.

43% of this segment has partially completed the series and 50% of this segment did receive a recommendation to get the vaccine (whether from a doctor or someone else). A little over half of this segment is currently sexually active. Most segments were predominantly non-religious, but this segment was approximately split 50/50 on religious or not religious.

This segment places a high importance on norms—whether from sexual partners, family members, or friends. They need norms addressed within the discussion. When asked what would sway them to get the vaccine, a sexual partner was rated higher than a doctor, nurse practitioner, or nurse. A personal connection (such as knowing someone with HPV) was also rated highly. They do trust doctors the most compared to other healthcare providers, family members, sexual partners, and friends, so if a doctor could have an open discussion with members of this segment and address these norms, that would be ideal.

Segment #2: "Every Day is a Challenge"

This segment has the highest mean scores for vaccine access barriers. 37% of this segment has partially completed the vaccine. This segment faces a wide range of barriers for getting and completing this vaccine series. Barriers include health insurance issues,

cost, access to the vaccine, lack of a nearby primary care doctor, transportation issues, and not knowing where to get the vaccine or how to schedule an appointment. This segment also has the second lowest mean scores for self-efficacy and perceived behavioral control. They need help making decisions and need help with actual follow-through of the decisions.

58% of this segment has never received a recommendation for the HPV vaccine. A little less than half of the segment is currently sexually active. This segment has the most diverse sexual orientations as well as being the most racially diverse.

For those in the segment that have begun the series, they need help overcoming their many barriers in order to complete the series. For those that have not yet started the series, they need clear information and instructions on how to get the vaccine—where it is available, how to schedule an appointment, whether it is covered by insurance or not, etc. All of these questions must be answered and explained.

Segment #3: "On the fence"

This second segment is smart—they had the second highest knowledge score, the second highest health consciousness scale score, the second highest baseline intention score, and the highest mean score for perceived susceptibility. They know about HPV, and they feel at risk—so why are they not getting the vaccine?

This segment is approximately tied with Segment #1 for agreement with the statement "I'll try new health behaviors but I'm not usually the first on my block to try them." They had the highest amount of agreement out of all segments with the statement "I'm not afraid to use non-traditional health care providers such as herbalists," as well as "I keep up with the latest scientific health information." Remember the individuals from

Aim 1 that would say they kept up with all vaccinations but then would reveal that they had never gotten a flu shot? They would be in this segment.

Greater than 50% of this segment are male and 40% are either dating someone or married. Similar to Segment #1, there is a 50/50 split on whether religious or not. The majority of this segment has been recommended to get the vaccine, with 64% stating that it had been previously recommended to them. 48% of this segment has partially completed the vaccine.

This segment has the highest vaccine safety barriers. Safety barriers include concerns about the safety of the vaccine, worrying about side effects, needing to do research or ask questions prior to getting the vaccine, or needing a doctor's recommendation prior to receiving it. When asked what would sway you, they selected knowing more about the vaccine, the safety of the vaccine, and the effectiveness of the vaccine following a doctor's recommendation. This segment needs their safety concerns addressed and needs more scientific and logical information about HPV and the HPV vaccine, preferably from a doctor.

Segment #4: "Busy (Smart) Bees"

This is the smallest group, making up only 1.2% of participants. However, it is important to keep this group as a stand-alone segment versus trying to place it within another segment. Although 1.2% may seem too small to make a difference, 1.2% of the total population of partially or never vaccinated individuals translates to a large amount of people that could easily become fully vaccinated with the right nudge.

This segment has the highest scores on attitudes, benefits, self-efficacy, perceived behavioral control, severity, and knowledge. They go to the doctor more frequently than

any other segment. The majority of this tiny segment is female, and the majority are sexually active. The majority of this segment has partially completed the vaccine series. What is preventing them from completing the series?

This segment faces the highest time barriers. Time barriers include having no extra time to get the vaccine, having to schedule an appointment first, and then having to schedule two to three doses to complete the series. This segment needs help overcoming these time barriers. Schedule all three vaccination appointments at one time, send reminders via text or email, and do whatever is necessary to help them find the time to get this series done. For those in the segment that have not started the series, present information from the WHO or CDC when explaining why the HPV vaccine is the right choice.

Segment #5: "That doesn't apply to me, does it?"

This segment has the highest overall barriers, highest vaccine belief barriers, and highest vaccine risk perception barriers. Vaccine belief barriers include feeling that the HPV vaccine is against religious beliefs, not getting vaccines in general, thinking friends or family wouldn't approve, being hesitant about vaccines in general or just the HPV vaccine, or thinking that shots are scary. Vaccine risk perception barriers include not feeling at risk for HPV or not being sexually active. 66% of this segment are not currently sexually active, which may explain some of the belief barriers that they have about the vaccine and why they need it. 87% of this segment has either never received any doses of the vaccine or is not sure whether they have or not. 70% of this segment has never received any recommendation to get the vaccine. Greater than 50% of this segment are male.

This segment doesn't think they are at risk for HPV, so they need to understand why they need this vaccine. Even if they are not currently sexually active, they need to understand more about HPV and why it is necessary for them to get vaccinated early before it is too late. This segment also needs their vaccine belief barriers addressed. This can be tricky, since beliefs about vaccines or healthcare are often developed early and take some effort to change.

Segment #6: "No idea and not interested"

Segment 6 is possibly the easiest segment to increase intentions to vaccinate. Their knowledge of HPV and the vaccine is basically non-existent. They have the lowest scores on attitudes, norms, benefits, perceived behavioral control, self-efficacy, severity, and susceptibility. However, they have to be really sick in order to see a doctor, limiting the number of opportunities for this vaccine to be brought up in conversation. In fact, 82% have never received a recommendation for this vaccine and 90% of this group claimed that they had never received any doses of the vaccine or were unsure if they had.

70% of this segment are single and greater than 50% are female. 36% of this segment are currently sexually active and 14% have been in the past. This segment needs education first and foremost. Even though they rarely go to the doctor, they need to be given information about this vaccine when they do happen to be in the office. Another solution would be to have a pharmacist give them a recommendation for this vaccine. While they did not rate a pharmacist recommendation as highly as other factors, this would allow them to have exposure to information from a healthcare provider that is often more accessible. After the recommendation, this segment needs information. Many

are completely unaware of HPV and the vaccine. They need someone to take the time to explain what is going on.

Table 4.76 Segment Summary

Segment	N (%)	Segment Demographics	Characteristics and/or Barriers	Need	Quotes from Interviews
"Keeping Up With the Kardashians"	139 **(21.1%)**	53% sexually active, 35% not currently, 12% have been in the past 43% partially completed vaccine series 55.4% have received a recommendation for the vaccine	Highest norms	Need norms addressed. When asked what would sway them to get the vaccine, a sexual partner was rated higher than a doctor, nurse practitioner, and nurse. Norms matter to this segment! A personal connection (such as knowing someone with HPV) was also rated highly.	*"P3: ...My girlfriends tried to encourage me to get it just because she's also strongly into the vaccination stuff and just like, just in case. You know, before time runs out and I get too old and stuff, so I might consider doing that."*
"Every day is a Challenge"	179 **(27.2%)**	Most diverse group for sexual orientation and race 37% have partially completed the HPV vaccine series 58% have NEVER gotten a recommendation to get the HPV vaccine	Highest access barriers Second lowest self-efficacy & perceived behavioral control	Need help overcoming access barriers. Explain where to get vaccine, how to schedule appointments, and check insurance/cost. If there are other access related barriers, see if there are ways to overcome these.	*"P8: ...And that's why I didn't get the third shot, because I would have had to drive home like three and a half hours to get it and I didn't know if you could get it like where I was at, I don't know if I just like didn't call because I didn't want like have to go through like the insurance and like oh. This person's on my*

					provider blah blah, so it was just easier if I didn't do it, and then time went by, and I just forgot about the third one.
"On the Fence"	104 **(15.8%)**	57.3% are male 48% have partially completed the vaccine series 64% HAVE received a recommendation to get the vaccine	Highest vaccine safety barriers. Second highest knowledge score & second highest health consciousness score Second highest baseline intention Highest susceptibility Keep up with latest scientific information yet also believe in non-traditional medicine	Address vaccine safety barriers. This segment wants to know more about the vaccine, the safety of the vaccine, more about HPV in general, and the effectiveness of the vaccine.	*"P10: well. This is all based on you know the years back my experience with it, but That risk of the paralysis I don't know how many people that occurred in, but that was very frightening for me so for that to be a concern I definitely would have considered it more um had that not been a risk, so I guess just a better safety profile."*
"Busy (Intelligent) Bees"	8 **(1.2%)**	88% female 75% sexually active	Highest knowledge (24/29 score) & highest attitudes Highest mean score for "frequently go for	Need vaccine time barriers addressed This segment is highly swayed by information from the WHO & CDC (show them information from these sources)	*"P13: …And you know with our schedules, you understand it's very hard to even take 20 minutes out of the middle of the workday to be like okay I'm going to go get this"*

			medical check-ups" Highest vaccine time barriers		
"That Doesn't Apply to Me, Does it?	87 **(13.2%)**	57.5% male 87% have either never gotten the vaccine or are unsure if they have 70% have NEVER been recommended to get the vaccine 66% are not currently sexually active (with 14% of these having been sexually active in the past)	Highest vaccine belief barriers, risk barriers, and highest overall mean barriers	Need vaccine belief barriers and risk perception barriers addressed 51.7% of this segment is not currently sexually active. Need to understand why the vaccine is needed, even if not currently planning on having sex	*"P17: um Personally, I feel okay with it because I don't feel like I am at much risk. So just Besides the fact that I didn't know about it, and now that I do know about it, I still won't get it probably. I you know I think goes back to I know who I am, and I know the kind of life that I have lived and I'm going to live in the future."*
"No Idea and Not Interested"	141 **(21.4%)**	57.6% female 70% are single 36% currently sexually active 90% have either never started the series or are not sure 82% have NEVER received a recommendation for the vaccine	Lowest scores on knowledge, norms, susceptibility, severity, benefits, attitudes, self-efficacy, perceived behavioral control Highest mean score for "I've got to be real sick in order to go to the doctor"	Need education! This segment does not go to the doctor frequently, so make sure to have the conversation when they do come in.	*"P17: Um Is, I I don't actually, I won't even pretend to know [what HPV is]"*

Reasons for not completing the series

For those that have partially completed the series, some respondents did cite reasons for stopping. While not everyone responded, the responses recorded allow us to understand some of the possible barriers individuals faced when trying to finish the HPV vaccination series. Reasons are listed below by individual segment in Table 4.83. The most commonly cited reasons for not completing the series were “got scared” and “forgot to schedule the appointment.” Other cited reasons included “moved away,” “had a bad reaction,” and “changed my mind,” among others.

The most commonly cited reason for Segment #1 was “forgot to schedule the appointment,” followed by “had a bad reaction.” Segment #2 cited “got scared,” and “moved away” as their top two reasons. For Segment #3, “got scared,” and “forgot to schedule the appointment” were the most commonly cited reasons. Segment #4 is a tiny segment but cited “forgot to schedule the appointment” as it’s number one reason. Segment #5 did not cite as many reasons compared to other segments, but the top reason was “forgot to schedule the appointment.” Like Segment #5, Segment #6 did not cite many reasons because it had the highest percentage of individuals who had never gotten the vaccine. For the ones that did start the series, the most common reason for not completing was “changed my mind.”

Table 4.77 Reasons for not completing the series *(numbers reflect how many individuals within each segment selected the reason, along with percentages within the segments)*

Reason	**Segment #1 139 (21.1%)**	**Segment #2 179 (27.2%)**	**Segment #3 104 (15.8%)**	**Segment #4 8 (1.2%)**	**Segment #5 87 (13.2%)**	**Segment #6 141 (21.4%)**	**Total 658**
Had a bad reaction	9 (6.8%)	10 (5.6%)	8 (7.7%)	N/A	N/A	N/A	27 (4.1%)
Got scared	14 (10%)	17 (9.5%)	14 (13.5%)	N/A	4 (4.6%)	2 (1.4%)	51 (7.8%)
Looked up more information	5 (3.6%)	10 (5.6%)	5 (4.8%)	N/A	N/A	N/A	20 (3%)
Changed my mind	7 (5%)	6 (3.4%)	6 (5.8%)	1 (12.5%)	N/A	3 (2.1%)	23 (3.5%)
A family member didn't approve	1 (0.7%)	7 (3.9%)	2 (1.9%)	N/A	N/A	2 (1.4%)	12 (1.8%)
A close friend didn't approve	1 (0.07%)	4 (2.2%)	2 (1.9%)	N/A	N/A	N/A	7 (1.1%)
Forgot to schedule the appointment	23 (16.5%)	8 (4.5%)	13 (12.5%)	3 (37.5%)	5 (5.7%)	1 (0.7%)	53 (8.1%)
Moved away	8 (5.8%)	12 (6.7%)	9 (8.7%)	N/A	1 (1.1%)	1 (0.7%)	31 (4.7%)
Lost my health insurance	8 (5.8%)	7 (3.9%)	3 (2.9%)	N/A	N/A	1 (0.7%)	19 (2.9%)
Too expensive	3 (2.2%)	3 (1.7%)	4 (3.8%)	N/A	1 (1.1%)	1 (0.7%)	12 (1.8%)
Other	"Never was told to get another"	"Didn't realize I didn't finish it"	"I realized I wasn't going to have sex, and then I	N/A	N/A	"Wasn't aware it was multiple doses"	

			forgot about completing it”				

What Would Sway You?

Participants were asked what would sway them to get the HPV vaccine. Several options were presented, including recommendations from all of the sources described above, information about HPV or the HPV vaccine, and various sources of delivery of information such as TV ads or YouTube.

Overall, across all segments, participants rated knowing more about HPV (3.48), knowing about the side effects of the HPV vaccine (3.46), knowing about the safety of the HPV vaccine (3.46), knowing about the effectiveness of the HPV vaccine (3.45), and knowing more about what HPV causes (3.45) the highest for what would sway them to get the HPV vaccine.

Different segments rated different items higher. This section is easier to interpret once it is divided into sections. One section reflects recommendations from various sources. The next section reflects information about HPV and the HPV vaccine. The last section reflects message delivery sources. See Table 4.83 for a breakdown of each segment's preferences within each section. Only items with a mean score greater than or equal to 3.00 are reported.

Table 4.78 What Would Sway You?

Segment	Highest (Mean Score) Preference Overall	Recommendation Preferences	HPV Information Preferences	Message Delivery Source Preferences
1	Knowing more about HPV (3.71)	Sexual partner (3.62), Nurse Practitioner (3.50), Doctor (3.47), Nurse (3.45), Family member (3.40)	Knowing more about the safety of the HPV vaccine (3.60), Personal Public connection (3.57), knowing more about the effectiveness of the HPV vaccine (3.55), knowing more about what HPV causes (3.51), knowing more about side effects (3.47)	Public campaign (3.31), TV ads (3.05), YouTube ads (3.04)
2	Knowing about side effects of the HPV vaccine (3.54)	Nurse (3.46), Sexual partner (3.33), Nurse Practitioner (3.26), Physician's Assistant (3.25), Doctor (3.24)	Knowing about side effects of the HPV vaccine (3.54), Knowing about the effectiveness of the vaccine (3.44), Knowing more about HPV/What HPV causes (3.41), Knowing more about the HPV vaccine (3.40)	Public campaign (3.26)
3	Doctor (3.86)	Doctor (3.86), Nurse (3.73), Nurse Practitioner/Physician's Assistant/CDC (3.70)	Knowing more about the HPV vaccine (3.85), Knowing more about the safety of the vaccine (3.83), Personal connection (3.81), Knowing more about HPV/Effectiveness of the HPV vaccine (3.80)	Public campaign (3.61), YouTube ads/Mobile app (3.14), Brochures (3.11), TV ads (3.08)

4	WHO (4.88)	WHO (4.88), CDC (4.75), Nurse (4.63), Physician's Assistant/Nurse Practitioner/Sexual Partner (4.50)	Knowing about effectiveness of the HPV vaccine/Side effects (4.50), Knowing that HPV can lead to 6 types of cancer affecting both men and women/Knowing what HPV causes (4.38)	Public campaign (4.50), Brochures (3.63), Posters (3.38), Text reminders (3.25), Billboards (3.13)
5	Knowing more about the HPV vaccine (3.55)	Doctor (3.37), Nurse (3.33), Sexual partner (3.30), Pharmacist/Friend (3.24)	Knowing more about the HPV vaccine (3.55), Knowing about the safety of the HPV vaccine (3.54), Knowing more about HPV (3.52), Knowing more about what HPV causes (3.45), Knowing about the clinical trials/Effectiveness of the vaccine (3.44)	Public campaign (3.36), YouTube ads (3.00)
6	Doctor (3.18)	Doctor (3.18), Sexual partner (3.06), Pharmacist/Nurse (3.01), WHO (3.00)	Knowing more about what HPV causes (3.13), Knowing more about the HPV vaccine (3.12), Knowing about the clinical trials (3.08), Knowing about side effects of the vaccine/Effectiveness (3.07)	Public campaign (3.03)

Regulatory Focus

Regulatory focus was found to be significantly different between the segments. Segment #1 was predominantly promotion focused. Segments #2, #3, #4, and #5 were approximately split between promotion and prevention focused. Segment #6 was approximately split between promotion, prevention, and a combination of the two.

Table 4.79 Segments Regulatory Focus (N=658)

RF Category		**Segment 1** (N=139)	**Segment 2** (N=179)	**Segment 3** (N=104)	**Segment 4** (N=8)	**Segment 5** (N=87)	**Segment 6** (N=141)	**Total** (N=658)
1.00 (Prevention)	Count	46	83	48	4	37	55	273
	% within RF category	16.8%	30.4%	17.6%	1.5%	13.6%	20.1%	100.0%
	% within (between groups)	33.1%	46.4%	46.2%	50.0%	42.5%	39.0%	41.5%
	% of total	7.0%	12.6%	7.3%	0.6%	5.6%	8.4%	41.5%
2.00 (Split)	Count	9	13	7	1	13	34	77
	% within RF category	11.7%	16.9%	9.1%	1.3%	16.9%	44.2%	100.0%
	% within (between groups)	6.5%	7.3%	6.7%	12.5%	14.9%	24.1%	11.7%
	% of total	1.4%	2.0%	1.1%	0.2%	2.0%	5.2%	11.7%
3.00 (Promotion)	Count	84	83	49	3	37	52	308
	% within RF category	27.3%	26.9%	15.9%	1.0%	12.0%	16.9%	100.0%
	% within (between groups)	60.4%	46.4%	47.1%	37.5%	42.5%	36.9%	46.8%
	% of total	12.8%	12.6%	7.4%	0.5%	5.6%	7.9%	46.8%
Total	Count	139	179	104	8	87	141	658
	% within	21.1%	27.2%	15.8%	1.2%	13.2%	21.4%	100.0%

	RF category							
	% within (between groups)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% of total	21.1%	27.2%	15.8%	1.2%	13.2%	21.4%	100.0%

Table 4.80 Segments Regulatory Focus: Chi-Square

	Value	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	41.087	10	<0.001
Likelihood Ratio	38.042	10	<0.001
Linear-by-Linear Association	4.297	1	0.038
N of Valid Cases	658		

Aim 3: Message Testing Results

The third aim of this dissertation was focused on creating targeted promotional HPV vaccination messages and testing them for effectiveness in increasing intention. Messages were created based upon the results from the Aim 1 interviews as well as the systematic review conducted on message framing used to increase HPV vaccination rates in the college-aged population. After the targeted messages were developed, they were tested within the cross-sectional survey to evaluate their effectiveness in increasing intention to vaccinate.

Message Development

During the qualitative interviews, participants were asked about preferences for messaging within healthcare, both generally and specific to the HPV vaccine. Responses ranged from the type of message preferred to the actual format or method of delivery. Many preferred a facts based messaging approach, with a few participants looking for more of an emotional appeal. See Table 4.87 for examples of message preferences.

A list of potential messaging strategies was developed based upon the current literature on messaging and the systematic review on message framing within the HPV vaccination space that was conducted. There are numerous messaging strategies that have shown promise in increasing intention to increase HPV vaccination. For example, loss-framing has been used in numerous studies within the HPV vaccination space and has been shown to be more successful than gain-framing. For this dissertation, nine messages were formally developed and tested to ensure that an adequate number of participants received each message within the survey. Messages were chosen wisely because of this. It was important to test a variety of messaging strategies yet also keep in mind what the

interview participants had selected as their preference for messaging. From the interviews, preferences included facts-based messaging, emotional appeals, fear tactics, and personal stories. All nine developed messages (excluding the control) included the statement “Get the HPV vaccine today to protect yourself and others from HPV.”

The control message was a fact-based message from Merck. Merck conducted a study on how pharmacists could converse with patients about the HPV vaccine. They developed some hypothetical conversations about HPV. The control message reads “HPV is a common virus. It's estimated that more than 85% of all sexually active adults become infected with HPV in their lifetime. For most people, HPV clears on its own. But for others that don't clear the virus, HPV could lead to certain cancers in both men and women. There is no way to know which patients who have HPV will develop cancer.” (Merck 2020d, CDC 2020d)

Facts-based messaging was the majority preference for messaging according to the interview participants. However, some key requests in addition to a facts-based message included actual statistics about HPV and/or the vaccine, information on side effects, information about the trials, and effectiveness of the vaccine. Some of the participants mentioned that they did not know the eligibility criteria for the HPV vaccine and would like to see that information presented somewhere. To account for some of these preferences, the control message was altered to read “The HPV vaccine can help you protect yourself and others from HPV-related cancers. It has minimal side effects and could prevent more than 90% of HPV-related cancers. The HPV vaccine is recommended for both men and women through age 26. If you haven’t yet received the vaccine, it’s not too late! Get the HPV vaccine today to protect yourself and others from HPV.

Cartmell et al. (2018) included the suggestion of adding a personal story to the overall message. The addition of a story from a cancer survivor reflecting on the fact that they wished they had known about the HPV vaccine may be enough to convince someone to get the vaccine. Because the idea of a more personal message was also mentioned in the interviews, a personal story was developed to be one of the nine messages. The personal story message reads 'I had no idea that HPV could cause cancer in both men and women. I got an HPV-related cancer and almost died. I didn't even know that I could have gotten the vaccine and protected myself." Don't let this story be your story. Get the vaccine today to protect yourself and others from HPV."

From the systematic review, anticipated regret was one of the strategies used to increase intention to vaccinate. The anticipated regret message developed also incorporates an emotional appeal. The message reads "The HPV vaccine protects both men and women from developing HPV-related cancers later in life. Imagine how you would feel if you got an HPV-related cancer and realized that you could have prevented it? Get the HPV vaccine today to protect yourself and others from HPV." This message was adapted from Kim et al. (2020).

Fear tactics were mentioned in the interviews and seen in the systematic review. While this message strategy was the least popular, it was included to be tested within a larger sample size. The fear message reads "can cause cancer in both men and women. If you don't get the HPV vaccine, you are at risk for getting HPV, which can lead to cancer, and ultimately, death. Get the HPV vaccine today to protect yourself and others from HPV."

Murdock et al. (2017) conducted several studies highlighting social versus health consequences and this style of messaging was used to develop five of the nine messages. The reason for this number of Murdock-style messages was due to the fact that both genital warts and cancer was tested as the negative health outcome. After this, both social and health consequences of cancer and genital warts were tested. This accounted for four of the Murdock-style messages. The fifth message was developed to answer a question from Murdock et al. (2017). While the last of the Murdock messages highlights cancer as the negative health outcome similar to previous messages, it highlights the financial consequences of cancer instead of social or health consequences. This message originally highlighted the health consequences of cancer but was updated to reflect financial consequences after being pre-tested. One of the students that it was pre-tested on read the message out loud and stated that it sounded expensive—thus the change from highlighting a health consequence to a financial consequence.

Table 4.81 Message Preferences from Qualitative Interviews

Preference	Quote(s)
Facts	*"P1: Um I want facts, so give me what's happening what's the deal, is it working? Don't give me this one person it worked, and they were dying, and the vaccine really just saved them, like no I need I'm gonna need some hard facts here. And what are the side effects."* *"P5: You said how I'd like it presented to me? um, I would like it presented in a more of a straight up way without the um I guess the flowery kind of hey come take our vaccine type of a message more like the straight facts of what the vaccine does and straight to the point of the symptoms and or if there's any symptoms of the vaccine or having um yeah just uh just coming clean really is how I like it to be presented."*
Personal	*"P2: um if I had had like a friend or someone, I know, like something happened to them because of it, that would probably have encouraged me more, or even if I had known like the specifics of it before I would have been like hey can I get this vaccine, but I just have never seen anything like that."*
Fear	*"P21: It's a what I would like to appeal to me the most is something fact based but I guess what what tends to work on me is like an emotional and like a "scare" like sort of appeal to it."*
Emotional	*"P17: I think just knowing you know kind of life, if you didn't have it, I mean there's so many I guess the messaging that I respond to best is saying like you know there's no really down side effects you know, for the most part, but this is what life would be like, if you didn't have it, you know so it's something as easy, as you know, three seconds and you died and you could save a lifetime of pain kind of thing."*

Table 4.82 Final Targeted Promotional Messages Developed

Type	Message	Constructs Addressed	Reference
Control	HPV is a common virus. It's estimated that more than 85% of all sexually active adults become infected with HPV in their lifetime. For most people, HPV clears on its own. But for others that don't clear the virus, HPV could lead to certain cancers in both men and women. There is no way to know which patients who have HPV will develop cancer.	Perceived Susceptibility, Perceived Severity, Attitudes, HPV Knowledge	Merck (2020)
Facts-based	The HPV vaccine can help you protect yourself and others from HPV-related cancers. It has minimal side effects and could prevent more than 90% of HPV-related cancers. The HPV vaccine is recommended for both men and women through age 26. If you haven't yet received the vaccine, it's not too late! Get the HPV vaccine today to protect yourself and others from HPV.	Perceived Susceptibility, Perceived Severity, Attitudes, HPV Knowledge, Perceived Barriers	Merck (2020), CDC (2020)
Murdock: Social Outcome + Social Consequence	HPV can cause genital warts, which can make you feel ugly and unattractive and adversely affect your social life. Get the HPV vaccine today to protect yourself and others from HPV.	Perceived Susceptibility, Perceived Severity, Attitudes, HPV Knowledge, Subjective Norms	Murdock et al. (2017)
Murdock: Health Outcome + Health Consequence	HPV can cause genital warts, which can cause discomfort and itching and can adversely affect your health. Get the HPV vaccine today to protect yourself and others from HPV.	Perceived Susceptibility, Perceived Severity, Attitudes, HPV Knowledge	Murdock et al. (2017)
Murdock: Social Outcome + Social	HPV can cause cancer, which can make you feel isolated and depressed and can adversely affect your social life. Get the HPV vaccine today to protect yourself and others from HPV.	Perceived Susceptibility, Perceived Severity, Attitudes, HPV Knowledge, Subjective	Murdock et al. (2017)

Consequence		Norms	
Murdock: Health Outcome + Health Consequence	HPV can cause cancer, damaging your cells and weakening your immune system, and can adversely affect your health. Get the HPV vaccine today to protect yourself and others from HPV.	Perceived Susceptibility, Perceived Severity, Attitudes, HPV Knowledge	Murdock et al. (2017)
Murdock: Health Outcome + Financial Consequence	HPV can cause cancer, often requiring chemotherapy, radiation, or surgery, costing you thousands of dollars. Get the HPV vaccine today to protect yourself and others from HPV.	Perceived Susceptibility, Perceived Severity, Attitudes, HPV Knowledge	Murdock et al. (2017)
Personal Story	'I had no idea that HPV could cause cancer in both men and women. I got an HPV-related cancer and almost died. I didn't even know that I could have gotten the vaccine and protected myself." Don't let this story be your story. Get the vaccine today to protect yourself and others from HPV.	Perceived Susceptibility, Perceived Severity, Attitudes, HPV Knowledge, Subjective Norms	Cartmell et al. (2019)
Fear Tactic	HPV can cause cancer in both men and women. If you don't get the HPV vaccine, you are at risk for getting HPV, which can lead to cancer, and ultimately, death. Get the HPV vaccine today to protect yourself and others from HPV.	Perceived Susceptibility, Perceived Severity, Attitudes, HPV Knowledge, Subjective Norms	
Anticipated Regret	The HPV vaccine protects both men and women from developing HPV-related cancers later in life. Imagine how you would feel if you got an HPV-related cancer and realized that you could have prevented it? Get the HPV vaccine today to protect yourself and others from HPV.	Perceived Susceptibility, Perceived Severity, Attitudes, HPV Knowledge, Subjective Norms	Kim (2020)

Message Pre-Testing

Once the messages were developed, they were pre-tested by the interview participants. Interview participants were sent an email thanking them for their participation and requesting their feedback on the messages developed. Out of 21 interview participants, thirteen completed the messaging pre-test survey.

Each message was presented, and participants were asked to select which messages would or would not encourage them to get the HPV vaccine. Answer choices included: “Honestly, this would not encourage me to get the HPV vaccine,” “This might encourage me to get the HPV vaccine,” and “This would greatly encourage me to get the HPV vaccine.” Answer choices were adapted from Wood and Schulman. Following this section, participants were given the opportunity to suggest improvements, state anything that was missing, and share thoughts.

Table 4.83 Feedback from Message Pre-Testing

Pre-Tested Message	Related Comments	FINAL Message
It's estimated that more than 85% of all sexually active adults become infected with HPV in their lifetime. For most people, HPV clears on its own. But for others who don't clear the virus, HPV could lead to certain cancers in both men and women. The HPV vaccine can help you protect yourself from HPV-related cancers.	"*Saying that it could clear by itself isn't motivation to get it."*	HPV is a common virus. It's estimated that more than 85% of all sexually active adults become infected with HPV in their lifetime. For most people, HPV clears on its own. But for others that don't clear the virus, HPV could lead to certain cancers in both men and women. There is no way to know which patients who have HPV will develop cancer.
It's estimated that more than 85% of all sexually active adults become infected with HPV in their lifetime. For most people, HPV clears on its own. But for others who don't clear the virus, HPV could lead to certain cancers in both men and women. The HPV vaccine can help you protect yourself from HPV-related cancers. The HPV vaccine has been studied in both men and women. It has minimal side effects and can prevent up to 90% of HPV-related cancers.	*"I responded well to the statements that contained the percentages and those data points."*	The HPV vaccine can help you protect yourself and others from HPV-related cancers. It has minimal side effects and could prevent more than 90% of HPV-related cancers. The HPV vaccine is recommended for both men and women through age 26. If you haven't yet received the vaccine, it's not too late! Get the HPV vaccine today.
HPV can cause genital warts, which can make you feel ugly and unattractive and adversely affect your social life. Get the HPV vaccine!	*"I'm definitely not influenced by the statements revolving around the aesthetics, such as the warts. The ones with numbers are more influential. Avoid the scare tactics."*	No change
HPV can cause genital warts, which can cause discomfort and itching and can adversely	*"I think talking about warts would increase chances of*	No change

affect your health. Get the HPV vaccine!	*people getting vaccine because so much stuff causes cancer nowadays it's like we are desensitized to it. Warts are ugly and people would not want that on their genitals."*	
HPV can cause cancer, which can make you feel isolated and depressed and can adversely affect your social life. Get the HPV vaccine!		No change
HPV can cause cancer, damaging your cells and weakening your immune system, and can adversely affect your health. Get the HPV vaccine!		No change
HPV can cause cancer, often requiring chemotherapy, radiation, or surgery, and adversely affecting your health. Get the HPV vaccine!		HPV can cause cancer, often requiring chemotherapy, radiation, or surgery, costing you thousands of dollars. Get the HPV vaccine today to protect yourself and others from HPV.
'I had no idea that HPV could cause cancer in both men and women. I got an HPV-related cancer and almost died. I didn't even know that I could have gotten the vaccine and protected myself." Don't let this story be your story. Get the vaccine today to protect yourself and others from HPV.		No change
HPV can cause cancer in both men and women. If you don't get the HPV vaccine, you are at risk for getting HPV, which can lead to cancer, and ultimately, death.		HPV can cause cancer in both men and women. If you don't get the HPV vaccine, you are at risk for getting HPV, which can lead to cancer, and ultimately, death. Get the HPV vaccine today to protect yourself and others

		from HPV.
The HPV vaccine protects both men and women from developing HPV-related cancers later in life. Imagine how you would feel if you got an HPV-related cancer and realized that you could have prevented it?	*"I loved the retrospective question, "how would you feel if you could have prevented it? " maybe add that to one of the info packed statements."*	The HPV vaccine protects both men and women from developing HPV-related cancers later in life. Imagine how you would feel if you got an HPV-related cancer and realized that you could have prevented it? Get the HPV vaccine today to protect yourself and others from HPV.
General Comments	*"Maybe instead of staying get the HPV vaccine! Add in a sentence about how the vaccine prevents the mentioned effect."* *"Some of the shorter messages seem a little bit aggressive and don't convey the full effects of HPV. The longer messages seem more effective at communicating the facts related to HPV."* *"Don't guilt or shame people or talk about how bad they'd feel, reiterate that the vaccine is safe and easy (mention that it's impossible to get HPV from the vaccine or something like that), don't overexplain stuff everyone probably knows about, like cancer or warts."*	

Message Testing

Messages were tested for their effectiveness in increasing intention to get the HPV vaccine. This was done at the beginning of the survey. Participants that had either a) never received any doses of the HPV vaccine, or b) had received partial doses of the HPV vaccine, were asked to rate their intentions to receive the vaccine. Intention was measured on a 5-point Likert scale, with three questions asked including: a) How likely is it that you'll try to get more information about the HPV vaccine? (1=very unlikely; 2=somewhat unlikely; 3=neither unlikely nor likely; 4=somewhat likely; 5=very likely), b) How likely is it that you'll consider getting the HPV vaccine?, c) How likely is it that you'll try to get the HPV vaccine? , d) How likely is it that you'll actually get the HPV vaccine?, and e) If a physician offered you the HPV vaccine in the next year, how likely is it that you'd get vaccinated? Mean scale scores were computed ranging from 0 to 5. After stating intentions, they were randomized to one of the nine messages or the control message and asked to rate intentions again based upon the message that they had just read.

Towards the end of the survey, all participants (regardless of vaccination status) were shown each message individually and asked to rate how likely the message would influence their intentions to receive the vaccine. All nine messages plus the control message were randomized and shown individually to each participant.

RQ7: Evaluating Which Messages Were Effective in Increasing Intention

A paired t-test was used to evaluate which messages were effective in increasing intention to vaccinate from baseline overall and within each segment. When looking at which messages increased intention overall, messages 1, 2, 3, & 10 were successful in

significantly increasing intention to vaccinate. See table 4.90 for the overall paired t-test results evaluating messages prior to placing participants into segments.

Messages 2, 3, and 10 were effective in increasing intentions for Segment #1. Message 5 was effective in increasing intentions for Segment #2. Message 3 was effective in increasing intentions for Segment #3. Segment #4 only saw one message, which did not significantly increase intention. Messages 5 and 8 were most effective in increasing intentions within Segment #5. Messages 4 and 5 were most effective in increasing intentions within Segment #6. See Table 4.91 for the paired t-test for each segment.

As previously described, participants were randomized to a message at the beginning of the survey and intention was measured both pre and post message. Towards the end of the survey, participants were able to view all messages (still randomized) and rate how likely each message would influence their intention to get the HPV vaccine.

For Segment #1, they rated message 4 the highest for likelihood of influencing intention. Message 7 was rated the highest by Segment #2. Segment #3 rated messages 4 and 10 the highest. Segment #4 rated messages 1 and 2 as the highest. Segment #5 rated message 6 the highest and Segment #6 rated messages 1 and 10 the highest. (Please see Table 4.45 for top three message preferences compared to which messages increased intentions from baseline) An ANOVA revealed that mean scores for this messaging section were significantly different between all segments.

Table 4.84 Paired T-Test for Evaluating Messages Overall (Numbers in **bold** are significant (N=658))

Message	Mean	Std. Deviation	Std. Error Mean	95% CI Lower	95% CI Upper	t	df	Significance (2-tailed)
1	-0.135	0.530	0.060	-0.255	-0.015	-2.234	76	**0.028**
2	-0.251	0.620	0.074	-0.397	-0.104	-3.405	70	**0.001**
3	-0.282	0.784	0.099	-0.480	-0.085	-2.860	62	**0.006**
4	-0.160	0.746	0.092	-0.345	0.025	-1.729	64	0.089
5	-0.076	0.786	0.103	-0.283	0.131	-0.735	57	0.466
6	0.087	1.602	0.190	-0.292	0.466	0.459	70	0.647
7	-0.098	0.738	0.093	-0.284	0.087	-1.059	62	0.294
8	-0.176	0.825	0.102	-0.379	0.027	-1.730	65	0.088
9	-0.091	0.530	0.070	-0.232	0.049	-1.298	56	0.200
10	-0.200	0.573	0.070	-0.334	-0.060	-2.856	66	**0.006**

Table 4.85 Paired T-Test for Segments (Numbers in **bold** are significant, numbers in ***bold italic*** are marginally significant(N=658))

Segment	Message	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval		t	df	Significance (two-tailed)
1 (N=139)	1	-0.262	0.656	0.164	-0.612	0.087	-1.600	15	0.130
	2	-0.453	0.614	0.141	-0.749	-0.157	-3.213	18	**0.005**
	3	-0.489	0.992	0.234	-0.982	0.005	-2.090	17	***0.052***
	4	0.236	0.871	0.263	-0.349	0.821	0.900	10	0.389
	5	0.275	1.185	0.419	-0.716	1.266	0.656	7	0.533
	6	0.280	1.241	0.392	0.392	1.168	0.714	9	0.494
	7	-0.156	0.529	0.125	-0.419	1.077	-1.247	17	0.229
	8	-0.444	1.019	0.339	-1.228	0.339	-1.309	8	0.227
	9	0.031	0.652	0.181	-0.363	0.425	0.170	12	0.868

	10	-0.341	0.573	0.139	-0.636	-0.046	-2.453	16	**0.026**
2 (N=179)	1	-0.163	0.540	0.115	-0.403	0.076	-1.420	21	0.170
	2	-0.247	0.627	0.152	-0.569	0.075	-1.626	16	0.124
	3	-0.235	0.933	0.226	-0.715	0.245	-1.039	16	0.314
	4	-0.200	0.528	0.108	-0.423	0.023	-1.857	23	0.076
	5	0.274	0.534	0.123	0.016	0.531	2.233	18	**0.038**
	6	0.094	1.533	0.372	-0.694	0.882	0.253	16	0.803
	7	-0.292	0.545	0.151	-0.622	0.0373	-1.932	12	0.077
	8	-0.280	0.999	0.258	-0.833	0.273	-1.085	14	0.296
	9	-0.116	0.575	0.132	-0.393	0.161	-0.878	18	0.391
	10	-0.013	0.346	0.086	-0.197	0.172	-0.144	15	0.887
3 (N=104)	1	-0.200	0.566	0.157	-0.542	0.142	-1.275	12	0.227
	2	-0.327	0.882	0.266	-0.919	0.265	-1.230	10	0.247
	3	-0.367	0.466	0.134	-0.663	-0.071	-2.727	11	**0.020**
	4	-0.240	0.847	0.268	-0.846	0.366	-0.896	9	0.394
	5	-0.175	0.671	0.237	-0.736	0.386	-0.737	7	0.485
	6	0.980	1.56	0.494	-0.137	2.097	1.984	9	0.079
	7	-0.033	0.856	0.247	-0.577	0.511	-0.135	11	0.895
	8	-0.667	0.412	0.134	-0.384	0.250	-0.485	8	0.641
	9	-0.240	0.433	0.194	-0.778	0.298	-1.746	13	0.104
	10	-0.329	0.704	0.188	-0.735	0.078	-1.746	13	0.104
4 (N=8)	6	1.200	1.697	1.200	-14.047	16.447	1.000	1	0.500
5 (N=87)	1	0.140	0.453	0.143	-0.184	0.464	0.978	9	0.354
	2	-0.029	0.534	0.202	-0.523	0.466	-0.141	6	0.892
	3	-0.067	0.413	0.169	-0.500	0.367	-0.395	5	0.709
	4	-0.400	1.166	0.369	-1.234	0.434	-1.085	9	0.306
	5	-0.720	0.910	0.288	-1.371	-0.069	-2.502	9	**0.034**
	6	-0.143	1.378	0.368	-0.938	0.653	-0.388	13	0.704
	7	-0.033	0.197	0.080	-0.240	0.173	-0.415	5	0.695

	8	-0.133	0.215	0.062	-0.270	0.003	-2.152	11	***0.054***
	9	-0.067	0.273	0.112	-0.353	0.220	-0.598	5	0.576
	10	-0.700	0.846	0.345	-1.588	0.188	-2.026	5	0.099
6 (N=141)	1	-0.0267	0.281	0.073	-0.183	0.129	-0.367	14	0.719
	2	-0.063	0.418	0.104	-0.285	0.160	-0.598	15	0.558
	3	-0.025	0.580	0.205	-0.510	0.460	-0.122	7	0.906
	4	-0.180	0.239	0.076	-0.351	-0.009	-2.377	9	**0.041**
	5	-0.246	0.384	0.107	-0.478	-0.139	-2.309	12	**0.040**
	6	-0.467	1.902	0.448	-1.413	0.479	-1.041	17	0.313
	7	0.071	1.114	0.298	-0.572	0.715	0.240	13	0.814
	8	-0.060	0.997	0.223	-0.527	0.407	-0.269	19	0.791
	9	-0.129	0.500	0.134	-0.417	0.160	-0.962	13	0.353
	10	0.108	0.240	0.066	-0.037	0.252	1.620	12	0.131

Table 4.86 Message Preferences by Segment

Segment	Increased intentions from baseline (t-test)	Significance (two-tailed)	Rated highest on likelihood to influence intentions	Mean score
1	2: The HPV vaccine can help you protect yourself and others from HPV-related cancers. It has minimal side effects and could prevent more than 90% of HPV-related cancers. The HPV vaccine is recommended for both men and women through age 26. If you haven't yet received the vaccine, it's not too late! Get the HPV vaccine today	0.005	4: HPV can cause genital warts, which can cause discomfort and itching and can adversely affect your health. Get the HPV vaccine today to protect yourself and others from HPV	3.76

	3: HPV can cause genital warts, which can make you feel ugly and unattractive and adversely affect your social life. Get the HPV vaccine today to protect yourself and others from HPV	0.052	6: HPV can cause cancer, damaging your cells and weakening your immune system, and can adversely affect your health. Get the HPV vaccine today to protect yourself and others from HPV	3.67
	10: The HPV vaccine protects both men and women from developing HPV-related cancers later in life. Imagine how you would feel if you got an HPV-related cancer and realized that you could have prevented it? Get the HPV vaccine today to protect yourself and others from HPV	0.026	10: The HPV vaccine protects both men and women from developing HPV-related cancers later in life. Imagine how you would feel if you got an HPV-related cancer and realized that you could have prevented it? Get the HPV vaccine today to protect yourself and others from HPV	3.68
2	5: HPV can cause cancer, which can make you feel isolated and depressed and can adversely affect your social life. Get the HPV vaccine today to protect yourself and others from HPV	0.038	7: HPV can cause cancer, often requiring chemotherapy, radiation, or surgery, and costing you thousands of dollars. Get the HPV vaccine today to protect yourself and others from HPV	3.56
			6: HPV can cause cancer, damaging your cells and weakening your immune system, and can adversely affect your health. Get the HPV vaccine today to protect yourself and others from HPV	3.53
			10: The HPV vaccine protects both men and women from developing HPV-related cancers later in life. Imagine how you would feel if you got an HPV-related cancer and	3.52

			realized that you could have prevented it? Get the HPV vaccine today to protect yourself and others from HPV	
3	3: HPV can cause genital warts, which can make you feel ugly and unattractive and adversely affect your social life. Get the HPV vaccine today to protect yourself and others from HPV	0.020	4: HPV can cause genital warts, which can cause discomfort and itching and can adversely affect your health. Get the HPV vaccine today to protect yourself and others from HPV	3.86
			10: The HPV vaccine protects both men and women from developing HPV-related cancers later in life. Imagine how you would feel if you got an HPV-related cancer and realized that you could have prevented it? Get the HPV vaccine today to protect yourself and others from HPV	3.86
			6: HPV can cause cancer, damaging your cells and weakening your immune system, and can adversely affect your health. Get the HPV vaccine today to protect yourself and others from HPV	3.82
4	N/A	N/A	8: ‘I had no idea that HPV could cause cancer in both men and women. I got an HPV-related cancer and almost died. I didn’t even know that I could have gotten the vaccine and protected myself.” Don’t let this story be your story. Get the vaccine today	4.50

			to protect yourself and others from HPV	
			1: HPV is a common virus. It's estimated that more than 85% of all sexually active adults become infected with HPV in their lifetime. For most people, HPV clears on its own. But for others that don't clear the virus, HPV could lead to certain cancers in both men and women. There is no way to know which patients who have HPV will develop cancer	4.38
			2: The HPV vaccine can help you protect yourself and others from HPV-related cancers. It has minimal side effects and could prevent more than 90% of HPV-related cancers. The HPV vaccine is recommended for both men and women through age 26. If you haven't yet received the vaccine, it's not too late! Get the HPV vaccine today	4.38
5	5: HPV can cause cancer, which can make you feel isolated and depressed and can adversely affect your social life. Get the HPV vaccine today to protect yourself and others from HPV	0.034	6: HPV can cause cancer, damaging your cells and weakening your immune system, and can adversely affect your health. Get the HPV vaccine today to protect yourself and others from HPV	3.43

	8: ‘I had no idea that HPV could cause cancer in both men and women. I got an HPV-related cancer and almost died. I didn’t even know that I could have gotten the vaccine and protected myself.” Don’t let this story be your story. Get the vaccine today to protect yourself and others from HPV	0.054	2: The HPV vaccine can help you protect yourself and others from HPV-related cancers. It has minimal side effects and could prevent more than 90% of HPV-related cancers. The HPV vaccine is recommended for both men and women through age 26. If you haven’t yet received the vaccine, it’s not too late! Get the HPV vaccine today	3.39
			4: HPV can cause genital warts, which can cause discomfort and itching and can adversely affect your health. Get the HPV vaccine today to protect yourself and others from HPV	3.39
6	4: HPV can cause genital warts, which can cause discomfort and itching and can adversely affect your health. Get the HPV vaccine today to protect yourself and others from HPV	0.041	1: HPV is a common virus. It's estimated that more than 85% of all sexually active adults become infected with HPV in their lifetime. For most people, HPV clears on its own. But for others that don't clear the virus, HPV could lead to certain cancers in both men and women. There is no way to know which patients who have HPV will develop cancer	3.14
	5: HPV can cause cancer, which can make you feel isolated and depressed and can adversely affect your social life. Get the HPV vaccine today to protect yourself and others from HPV	0.040	10: The HPV vaccine protects both men and women from developing HPV-related cancers later in life. Imagine how you would feel if you got an HPV-related cancer and	3.14

			realized that you could have prevented it? Get the HPV vaccine today to protect yourself and others from HPV	
			7: HPV can cause cancer, often requiring chemotherapy, radiation, or surgery, and costing you thousands of dollars. Get the HPV vaccine today to protect yourself and others from HPV	3.12
			8: ‘I had no idea that HPV could cause cancer in both men and women. I got an HPV-related cancer and almost died. I didn’t even know that I could have gotten the vaccine and protected myself.” Don’t let this story be your story. Get the vaccine today to protect yourself and others from HPV	3.12

RQ8: Trust of Various Sources

Participants were asked to rate their level of trust concerning HPV information coming from various sources. Sources included healthcare professionals, family members, friends, sexual partners, the FDA, pharmaceutical companies, among others. Overall, across all segments, doctors (3.60), pharmacists (3.24), and nurses (3.20) had the highest mean scores for level of trust. Dentists (2.64), dental hygienists (2.67), and the U.S. government (2.73) had the lowest mean scores.

When looking each segment, mean level of trust varied by segment. All segments rated that they trusted a doctor the most, but there was variation in the sources that were second most trusted and least trusted. Segment #4 had higher overall ratings of trust and Segment #6 had the lowest overall ratings of trust. See Tables 4.93, 4.94, and 4.95 for more information.

Table 4.87 Trust of Various Sources of Information (People) (N=658)

Segment	**Doctor** Mean (SD)	**Pharmacist** Mean (SD)	**Physician's Assistant** Mean (SD)	**Nurse Practitioner** Mean (SD)	**Nurse** Mean (SD)	**Dentist** Mean (SD)	**Dental Hygienist** Mean (SD)	**Family Member** Mean (SD)	**Close Friend** Mean (SD)	**Sexual Partner** Mean (SD)
1 (N=139)	3.82 (1.023)	3.45 (1.078)	3.47 (0.973)	3.35 (1.076)	3.35 (1.102)	2.81 (1.171)	2.80 (1.264)	3.02 (1.182)	2.92 (1.180)	3.28 (1.090)
2 (N=179)	3.49 (1.103)	3.23 (1.034)	3.07 (1.105)	3.07 (1.137)	3.16 (1.194)	2.68 (1.211)	2.78 (1.269)	2.94 (1.198)	2.94 (1.205)	3.05 (1.228)
3 (N=104)	4.02 (1.079)	3.56 (1.113)	3.55 (1.140)	3.53 (1.174)	3.62 (1.151)	2.76 (1.326)	2.91 (1.394)	3.11 (1.230)	3.10 (1.273)	3.14 (1.375)
4 (N=8)	4.63 (0.744)	3.88 (1.246)	4.13 (0.835)	4.13 (0.835)	3.88 (0.991)	3.25 (1.389)	3.13 (1.356)	3.00 (1.069)	2.87 (1.356)	3.25 (1.282)
5 (N=87)	3.56 (1.064)	3.21 (1.143)	3.10 (1.121)	3.05 (1.088)	3.17 (1.091)	2.67 (1.075)	2.60 (1.156)	2.99 (1.126)	2.89 (1.176)	2.98 (1.229)
6 (N=141)	3.18 (1.199)	2.78 (1.128)	2.76 (1.158)	2.74 (1.163)	2.76 (1.114)	2.30 (1.157)	2.26 (1.192)	2.32 (1.044)	2.30 (1.089)	2.43 (1.104)
Total	3.60 (1.133)	3.24 (1.123)	3.18 (1.133)	3.14 (1.159)	3.20 (1.167)	2.64 (1.207)	2.67 (1.277)	2.86 (1.188)	2.82 (1.212)	2.97 (1.233)

Table 4.88 Trust of Various Sources (Organizations) (N=658)

Segment	**U.S. Government** Mean (SD)	**FDA** Mean (SD)	**CDC** Mean (SD)	**WHO** Mean (SD)	**Pharmaceutical Drug Company** Mean (SD)
1 (N=139)	2.91 (1.160)	3.00 (1.239)	3.38 (1.265)	3.41 (1.185)	2.94 (1.190)
2 (N=179)	2.78 (1.237)	2.77 (1.262)	3.06 (1.205)	3.02 (1.163)	2.78 (1.242)
3 (N=104)	2.95 (1.332)	3.17 (1.361)	3.55 (1.343)	3.65 (1.349)	3.11 (1.400)
4 (N=8)	2.88 (0.835)	3.25 (1.282)	4.38 (0.916)	4.25 (0.707)	2.25 (1.753)
5 (N=87)	2.69 (1.184)	2.72 (1.227)	3.03 (1.359)	3.06 (1.367)	2.68 (1.206)
6 (N=141)	2.36 (1.129)	2.39 (1.120)	2.64 (1.191)	2.68 (1.185)	2.41 (1.070)
Total	2.73 (1.218)	2.80 (1.264)	3.13 (1.296)	3.15 (1.272)	2.77 (1.243)

Table 4.89 Summary Table of Most & Least Trusted Sources Across Segments (N=658)

Segment	**Most Trusted (Mean Score)**	**Least Trusted (Mean Score)**
1 (N=139)	Doctors (3.82), Physician's Assistant (3.47), Pharmacist (3.45), WHO (3.41), CDC (3.41)	Dental hygienist (2.80), Dentist (2.81), the U.S. government (2.91), Close friend (2.92), Pharmaceutical company (2.94)
2 (N=179)	Doctor (3.49), Pharmacist (3.23), Nurse (3.16), Physician's Assistant (3.07), Nurse Practitioner (3.07)	Dentist (2.68), FDA (2.77), The U.S. government (2.78), Pharmaceutical company (2.78), Dental hygienist (2.78)
3 (N=104)	Doctor (4.02), WHO (3.65), Nurse (3.62), Pharmacist (3.56), Physician's Assistant/CDC (3.55)	Dentist (2.76), Dental hygienist (2.91), U.S. government (2.95), Close friend (3.10), Family member/Pharmaceutical company (3.11)
4 (N=8)	Doctor (4.68), CDC (4.38), WHO (4.25), Physician's Assistant/Nurse (4.13)	Pharmaceutical company (2.25), Close friend (2.87), U.S. government (2.588), Family member (3.00), Dental hygienist (3.13)

5 (N=87)	Doctor (3.56), Pharmacist (3.21), Nurse (3.17), Physician's Assistant (3.10), WHO (3.06)	Dental hygienist (2.60), Dentist (2.67), Pharmaceutical company (2.68), U.S. government (2.69), FDA (2.72)
6 (N=141)	Doctor (3.18), Pharmacist (2.78), Physician's Assistant/Nurse (2.76), Nurse Practitioner (2.74)	Dental hygienist (2.26), Dentist/Close friend (2.30), Family member (2.32), U.S. government (2.36)

Open-Ended Preferences for HPV Messaging

After viewing the 10 developed messages and rating each message on how likely it would influence intention to get the HPV vaccine, participants were able to input their own preferences for HPV vaccine messaging via an open-ended text response. See Table 4.48 below for some of the open-ended responses.

Table 4.90 HPV Messaging Preferences Open-Ended Comments (N=658)

Segment	Comments
1 (N=139)	*"Appeal more to younger people"* *"Just showing proof it actually works and proof it doesn't backfire the testers health in the future"* *"I would like to see messaging strategies to make sure I'm as safe as I can be"* *"Showing how many lives it could save, the effectiveness, personal experiences, and educating people in what HPV actually is in order to convince them to protect themselves"* *"Not as much fear mongering but more testimonials from people, not drug companies"*
2 (N=179)	*"Blunt facts, and keep it simple, not too wordy. Don't try too hard to appeal to a certain group of people, sounds clunky."* *"Research in magazines or websites"* *"More facts, more openness, and more messaging in general"* *"Make it scary but not grossly detailed"* *"Letting me know the side effects"*
3 (N=104)	*"Actual facts and efficacy of vaccine"* *"Add a percentage to how many people ACTUALLY took the vaccine"* *"Reminders to get shots 2-3"* *"More education in school"* *"Clarity about how necessary it is for people that are not sexually active."*
4 (N=8)	*"Destigmatized"* *"Guarantees of safety"* *"More public information available. Have doctors more willing to talk to their patients about the risk of HPV. Proven facts are the best way to express the dangers of the virus"* *"More information about how effective the vaccine is and how much easier it makes your life"*
5 (N=87)	*"A lot more know nothing about it"* *"A positive 'get the vaccine!' ad, maybe with a comedic twist not written by boomers"* *"All of them. More exposure leads to less stigmatization"* *"YouTube Channel to get out to the people who watch more videos"* *"The percentages of people that have HPV and areas more in danger of getting HPV"*

	"Telling people the possible consequences of not getting it"
6 (N=141)	*"A doctor I know saying like hey get the HPV vaccine to save people like you and me today!"* *"Showing example of the thing that may happen without getting this vaccine"* *"The actual ingredients and what they really do to your body"* *"Tell Asexual people why it would be worth it for them to get the vaccine"* *"TV ads and doctor recommendations"*

Table 4.91 Results Supported by Hypothesis or Not

Aim	RQ	Data Analysis	Hypothesis	Supported or Not
2	RQ3: Which factors predict HPV vaccination uptake?	Multinomial Regression	Factors including knowledge, attitudes, subjective norms, perceived behavioral control, perceived susceptibility, perceived severity, and perceived barriers will predict HPV vaccination uptake	Yes
2	RQ4: Which factors predict HPV vaccination intention?	Multiple Linear Regression	Factors including knowledge, attitudes, subjective norms, perceived behavioral control, perceived susceptibility, perceived severity, and perceived barriers will predict HPV vaccination intention	Yes
2	RQ 5: Do theory constructs such as attitudes and perceived susceptibility differ based upon vaccination status?	ANOVA/Chi-square	Theory constructs will differ based upon vaccination status	Yes
2	RQ6. Which segments exist within the 18-26 year old population that may predict	Hierarchical Clustering	4-5 unique segments will be identified within this population	Yes, unique segments were able to be

	HPV vaccination intention?			identified within this population. However, 6 segments were identified rather than 4-5.
3	RQ7: Which messages are effective in increasing intention to vaccinate?	Paired t-test	Each segment will have its own message preference and respond differently to a message when compared to another segment	Yes
3	RQ8: What preferences do 18-26 year old's have for HPV vaccine message delivery?	Compare means/ANOVA	Messages attributed to healthcare providers will be perceived as more trustworthy than those attributed to friends, family, or celebrities	Yes

CHAPTER 5

DISCUSSION

This mixed-methods study explored the barriers and facilitators of HPV vaccination within the 18-26 year old population, created and tested promotional messages for their effectiveness in increasing intention to vaccinate, and conducted a market segmentation to define the segments and understand preferences related to HPV vaccination messaging. This chapter summarizes and explains the results, discusses the significance of findings, and outlines limitations of this study. Future directions are presented and discussed.

Summary and Discussion of Qualitative Findings

Identification of barriers and facilitators to HPV vaccination among males and females 18-26 years of age is critical to increasing HPV vaccination rates and prevention of HPV-associated cancers. Barriers and facilitators of HPV vaccination for this population has previously been explored in the literature (Dibble et al., 2019, Ferrer et al., 2014, Gerend et al., 2016, Hirth et al., 2018). However, the majority of studies focused on females rather than males. This is expected given the initial approval of this vaccine for use only in females. However, both males and females can contract HPV and the increasing incidence of HPV-associated cancers in men underscores the importance of evaluating barriers and facilitators that include the male perspective. In fact, the amount

of HPV-associated oropharyngeal cases in men now outnumbers the amount of HPV-associated cervical cases in women (CDC 2020e). Furthermore, few studies have examined HPV vaccination barriers and facilitators from the perspective of those that have only partially completed the series. The qualitative interviews conducted as part of this dissertation add to the literature by providing more information from the male perspective as well as from the partially vaccinated perspective. In addition to exploring barriers and facilitators of uptake, the interviews aimed to gain more insight into which segments may exist and messaging preferences within this population.

Key Theory Constructs Related to HPV Vaccination

Several Theory of Planned Behavior and Health Belief Model constructs were identified by interview participants as having a strong influence on HPV vaccination intention or acceptance.

Facilitators

Cues to Action, a Health Belief Model construct described as a stimulus, either external or internal, to initiate a decision-making process to consider HPV vaccine acceptance was found to be a strong facilitator (Rosenstock et al., 1988). All vaccinated individuals talked about how the vaccine was recommended to them by a doctor or family member. Often, a vaccine recommendation is the sole reason for vaccine acceptance. Once participants received the recommendation, they got the vaccine immediately, no questions asked. These results are consistent with the previous literature identifying a strong provider recommendation as one of the most important factors in vaccine acceptance. Ylitalo et al. (2013) found that there was a strong association between a provider recommendation and actual HPV vaccination, across all ethnic and

racial groups aged 13-17 when looking at National Immunization Survey–Teen data. Similarly, Gerend et al. (2016) found that participants between the ages of 18 and 26 who received a recommendation were over 35 times more likely to receive 1 or more doses of the HPV vaccine compared to those who did not receive a recommendation. However, the style of recommendation can impact success. While many physicians report making HPV vaccine recommendations, those that report high levels of refusal often are not using a presumptive approach. A presumptive style, including messaging that assumes vaccine acceptance, has been shown to be associated with greater rates of vaccine acceptance (Kempe et al., 2019). Other constructs, including perceived benefits, attitudes, and behavioral intentions were found to facilitate intention or acceptance but at a less substantial level in comparison to cues to action.

Barriers

The strongest barriers identified to HPV vaccination included perceived susceptibility, perceived barriers, and relationship status. Overall, most participants did not feel at risk for getting HPV or HPV-related cancer. Because of this, they did not feel that they needed the vaccine. This is especially concerning since HPV is the most common STI, often showing no signs or symptoms. Yet most truly believe that they have low susceptibility to HPV (Barnard et al., 2017).

Perceived barriers were high on the list because participants did not seem able to overcome the specific barriers that they were facing. These barriers include vaccine belief barriers, as well as access and time barriers. Belief barriers can include being hesitant about the HPV vaccine or vaccines in general (Hirth 2018, Pierre-Victor 2018). Access was a critical barrier. Many of the partially vaccinated individuals expressed an interest in

completing the vaccine series but were unsure of how to schedule the appointment or where to go. Some individuals had moved away for college and a large amount of time had passed since their first HPV vaccine dose, leaving them hesitant about whether they could still complete the series or not. This finding is consistent with previous literature. Access barriers have also been found to have a significant impact on HPV vaccination intention, with Hirth et al. (2018) finding that many felt they would forget to schedule or show up for vaccination appointments. Kellogg et al. (2019) found that almost half of the college students sampled were unaware that they could receive the HPV vaccine at either the local community clinic or student health center. For a few participants that were interviewed, making the time to get all three doses of the vaccine was a challenge. While belief barriers and barriers related to access can be challenging to overcome, it is possible to do so with identification of those that face these barriers and joint problem solving between provider and patient.

Relationship status played a critical role in intention to vaccinate, with it mostly influencing participants to not get the vaccine. Participants dating someone did not feel that they needed the vaccine, especially if they had been dating for a few years. This was also found by Thompson et al. (2019) and Pierre-Victor et al. (2018). What is concerning about this is the fact that relationships often end. The 18-26 year old population represents the last opportunity to be fully vaccinated while it is still recommended (and not just by a case by case basis). It would be unfortunate for someone to miss their opportunity to be fully vaccinated because they wrongly assumed that their relationship would last forever. Dibble et al. (2019) found that sexual activity can act as both a barrier and facilitator to HPV vaccination. Within this study, sexual activity played a role as a

barrier the majority of the time. A few participants cited sexual activity as the reason for vaccination; to protect themselves. However, the majority of sexually active participants claimed to be in committed relationships where they were only sexually active with one person and had complete trust in the other individual.

Mixed Impact

A few constructs had a mixed impact on intention to vaccinate, including perceived severity, subjective norms, and HPV knowledge and/or reactions to HPV information. A code was determined to have a mixed impact when there was an equal number of comments regarding the specific code as either a barrier or facilitator to vaccination. Many participants did not think that HPV was very severe, even knowing that it could lead to cancer. Katz et al. (2011) found this phenomenon among college aged males. Other participants upon hearing that HPV could lead to cancer, were shocked and asked whether it was too late for them to get the vaccine. Subjective norms is a powerful tool that can either be a barrier or facilitator to vaccination. Some stated that they got the vaccine because parents encouraged them to do so. However, one participant mentioned that one of their friends got the HPV vaccine and still got HPV, leaving the participant skeptical about completing the series. Richards (2015) found that norms had the most influence on intentions to vaccinate. Hirth et al. (2019) found that individuals within this age group often relied on family, sexual partners, and healthcare providers to help them make the decision to get vaccinated for HPV. However, Hirth et al. also found that friends did not have much of an influence. This differs from the present study, where input from friends was identified as an influential factor. HPV knowledge can work as a barrier or facilitator as well. Most studies have found that HPV knowledge, either lack of

or misinformation, works as a barrier to vaccination (Albright & Allen 2018, Hirth et al., 2018, Katz et al., 2011, Kellogg et al., 2019, Pitts et al., 2017). Thanasas et al. (2020) stressed the importance of increasing adolescent HPV knowledge through schooling, primary health care, and informative interaction interventions. This would certainly improve baseline HPV information for young adults in the 18-26 year old population and aid in acceptance of the vaccine. A few participants knew some factual information about HPV but were still unsure about their intentions. Other participants were ready to get vaccinated after hearing more about HPV and what it could lead to. Often the type of information about HPV that is presented makes a difference. For most interview participants, hearing that HPV could cause cancer in both men *and* women immediately influenced intentions.

Summary and Discussion of Segmentation Survey Findings

This is the first identifiable study to conduct a market segmentation of the 18-26 year old population with the end goal of improving intention to receive the HPV vaccine. Previous studies have examined the impact of various methods of HPV messaging on vaccine intention and acceptance (Baxter & Barata 2011, Gainforth & Latimer 2012, Gerend & Shepherd 2007, Kim 2020, Nan 2012). However, segmentation of this population allows for identification of targeted messaging strategies to address unique barriers and concerns. Segmentation was done using a hierarchical clustering approach, with three to six segment solutions analyzed. The final segmenting variables included attitudes, subjective norms, perceived susceptibility, and knowledge. These variables closely aligned with the initial hypothesis regarding which factors would differentiate the segments from one another. Attitudes were included to account for the various

viewpoints towards HPV vaccination. Subjective norms were essential to include as this population often places a high importance on the opinions of friends and family when making the decision to get the HPV vaccine (Hirth et al., 2018). This population often does not feel at risk for contracting HPV, which made perceived susceptibility an important factor to include (Pierre-Victor et al., 2018, Thompsen et al., 2019). Finally, many have found knowledge to be a barrier to vaccination (Hirth 2018 et al., Kellogg et al., 2019, Pitts et al., 2017). The key was to use the correct segmenting variables to ensure that the segments created could be described sufficiently, were different from one another regarding key variables, and had unique preferences regarding the HPV vaccine.

Subjective Norms: "Keeping up with the Kardashians"

The first segment, "Keeping up with the Kardashians", places a high importance on subjective norms—whether from sexual partners, family members, or friends. In this study, subjective norms include an individual's beliefs about what other people in their social group will think about them getting the HPV vaccine as well as the individual's motivation to conform to these perceived norms. This segment wants to know what others in their social group think about the HPV vaccine, and whether or not they want them to get the vaccine. They need norms addressed within the overall HPV vaccine discussion. Physicians and other healthcare professionals providing recommendations can incorporate messages that shift negative or neutral subjective norms, or in the case of patients that already have positive subjective norms, reinforce those norms through their discussion. While this segment indicated a preference for several messages, a Murdock style message, "HPV can cause genital warts, which can make you feel ugly and unattractive and adversely affect your social life. Get the HPV vaccine today to protect

yourself and others from HPV" was found to significantly improve intention. The emphasis on social outcomes and social consequences may impact the perceived subjective norms of this group and could be successful in improving vaccine uptake. Xiao & Borah (2019) found that additional exposure to injunctive normative messages compared to basic information increased intention to seek further information about HPV vaccination, leading to the conclusion that incorporating norms into the messaging strategy could lead to promising results.

Barriers to Access: "Every day is a Challenge"

Segment #2 faces the highest vaccine access barriers. This segment also has the second lowest mean scores for perceived behavioral control and self-efficacy. Interestingly, this segment is the most diverse in terms of sexual orientation and race. For those in the segment that have not initiated the series, they want and need information. For those in the segment that have begun the series, they need help overcoming their many barriers in order to complete the series. This segment may be more prone to transportation, cost, health insurance, and other barriers that limit their ability to obtain the HPV vaccine. This segment may not have a nearby primary care doctor or may not know where or how to get the HPV vaccine. Given the concern this group has with cost and access to care, messages that emphasize financial consequences of HPV may be more successful. For example, "HPV can cause cancer, often requiring chemotherapy, radiation, or surgery, and costing you thousands of dollars. Get the HPV vaccine today to protect yourself and others from HPV" focuses on cancer but also incorporates the financial consequences of cancer. For those facing access barriers within this segment, specifically cost related, this message may be a good option to present. However, this

group will likely require strategies beyond messaging to help them overcome access barriers to receiving the vaccine.

Vaccine Safety: "On the Fence"

Segment #3 is intelligent and knows about HPV and the HPV vaccine. In fact, they have the second highest knowledge score out of all segments. However, this segment also has the greatest level of concern with vaccine safety, which explains some of the hesitancy concerning this vaccine. This segment needs their safety concerns addressed. Providers should explain why they need the vaccine (to help prevent cancer and genital warts) and also emphasize that the vaccine is not only effective but also safe. Interestingly the facts-based message that highlights minimal side effects associated with this vaccine, "The HPV vaccine can help you protect yourself and others from HPV-related cancers. It has minimal side effects and could prevent more than 90% of HPV-related cancers. The HPV vaccine is recommended for both men and women through age 26. If you haven't yet received the vaccine, it's not too late! Get the HPV vaccine today to protect yourself and others from HPV," was not found to significantly improve intention and was not selected as a preferred message. Messages that briefly mention "minimal side effects" may not be sufficient to ease the concerns of this knowledgeable group. They likely have sought out information to explore side effects of the vaccine and need a more in depth discussion of the severity and rarity of these side effects as well as the balance of these risks versus benefits.

Time: "Busy (Intelligent) Bees"

Segment #4 accounts for only 1.2% of this population but is still essential to include. This segment has the highest scores on attitudes, benefits, self-efficacy,

perceived behavioral control, severity, and knowledge. They go to the doctor for check-ups more frequently than any other segment. This segment represents the perfect patient! What is preventing them from completing the HPV vaccine series? Time is the biggest barrier faced by this segment. This segment needs help overcoming these time barriers. The facts-based message, "The HPV vaccine can help you protect yourself and others from HPV-related cancers. It has minimal side effects and could prevent more than 90% of HPV-related cancers. The HPV vaccine is recommended for both men and women through age 26. If you haven't yet received the vaccine, it's not too late! Get the HPV vaccine today," emphasizes running out of time and was a preferred message for this group. However, strategies in addition to this message such as scheduling all three vaccination appointments at one time and sending reminders via text or email may be required within this population. A systematic review conducted by Francis et al. (2017) found that the use of communication technologies such as recall/reminder prompts, text messages, and emails targeted to both providers and patients usually resulted in higher rates of HPV vaccine initiation and completion. Although they do go to the doctor more frequently than other segments, making the time to schedule three more visits for the HPV vaccine may seem overwhelming to this segment. If one of the three required doses could be given at the regular check-up, this may aid in series completion as well. This segment would benefit from the use of communication technologies such as these to help them remember to schedule follow-ups and complete the series.

Beliefs and Risk Perception: "That Doesn't Apply to Me, Does it?"

Segment #5 has the highest overall barriers, highest vaccine belief barriers, and highest vaccine risk perception barriers. The majority of this segment are currently not

sexually active, which may contribute to their perceptions that they are not at risk for HPV and don't need this vaccine. Even if they are not currently sexually active, they need to understand more about HPV and why it is necessary for them to get vaccinated early before it is too late. Belief barriers may be challenging to overcome. Even during the Aim 1 interviews, some participants shared that they did not believe in getting vaccines. One participant felt that they did not need the vaccine because they were extremely religious and would not be in a position to where they might end up contracting HPV. Overcoming these belief and/or risk perception barriers takes time and continuous discussion. It requires a provider to have an open conversation with the patient about their beliefs and understand why they believe what they do. Intention within this segment was found to increase when the following message was provided: "I had no idea that HPV could cause cancer in both men and women. I got an HPV-related cancer and almost died. I didn't even know that I could have gotten the vaccine and protected myself. Don't let this story be your story. Get the vaccine today to protect yourself and others from HPV." This message emphasizes perceived susceptibility or risk, which is lacking within this segment.

Lack of Knowledge: "No Idea and Not Interested"

Segment #6 is possibly the easiest segment to address. Overall, they have the lowest scores on all of the key variables regarding intentions to vaccinate for HPV. Their knowledge of HPV is extremely lacking, or completely non-existent. For this group, all that may be required is an increase in awareness and knowledge. During qualitative interviews, many participants were shocked when they learned that HPV can lead to six different types of cancer affecting both men and women. These two facts, that HPV can

lead to cancer and that HPV can affect both men and women, immediately changed the intentions of the participants. After hearing this information, they wanted to know whether it was too late for them to get the vaccine. One participant shared that if that information had been presented to him years ago, they might have considered getting the vaccine. Messages that emphasized the social outcomes and consequences of cancer, "HPV can cause cancer, which can make you feel isolated and depressed and can adversely affect your social life. Get the HPV vaccine today to protect yourself and others from HPV." As well as the health outcomes and consequences of genital warts, "HPV can cause genital warts, which can cause discomfort and itching and can adversely affect your health. Get the HPV vaccine today to protect yourself and others from HPV," significantly improved intention in this group. Specific messaging strategy may be flexible in this group, as lack of knowledge and awareness is the greatest concern.

Leask et al. (2012) conducted a study evaluating the types of parents that existed within the vaccination space and created a guide to be used when communicating with parents about their child's vaccination status, not specific to the HPV vaccine. They found that there were five groups of parents—the unquestioning acceptor, the cautious acceptor, the hesitant, the late or selective acceptor, and the refuser. While the current study focused on young adults rather than parents, there are some parallels. Segment #3 most closely represents the "late or selective vaccinator" as described by Leask et al. (2012). They are hesitant about the vaccine and have concerns about safety and other variables. They actively search for information, which results in high knowledge about the vaccine. Segment #4 most closely represents the "unquestioning acceptor"—they want the vaccine but are only held up by time issues involving scheduling of all three

doses. Segment #5 has both belief and risk perception barriers, leading to a small percentage of this segment being "refusers." The categories developed by Leask et al. (2012) do not fully capture what is going on within this population, especially since they are focused on parents. While there are some similarities between groups, especially the "late or selective vaccinators" and Segment #5 as well as the "unquestioning acceptors" and Segment #4, the other groups do not fully explain the current segments found within the 18-26 year old population in relation to the HPV vaccine. The segments identified and described in the current study, fill this gap in the literature.

Overall, knowledge about HPV and the HPV vaccine is extremely lacking or nonexistent overall and varies by segment. The knowledge scale used within this survey had a max score of 29. No participant, regardless of vaccination status, scored higher than a 27. While those that are vaccinated do have higher levels of knowledge, their knowledge is far from perfect. HPV isn't well known and isn't talked about. While this study is focused on how healthcare providers can target messaging based upon which segment an individual belongs to, greater exposure to HPV information through public campaigns, ads, and other sources, is warranted.

Regardless of segment, subjective norms, biological sex at birth, race, perceived susceptibility, perceived behavioral control, and were found to be predictors of intention. While subjective norms, knowledge, attitudes, gender identity, and race were found to be predictors of vaccine uptake. As expected, those that were completely vaccinated had the highest mean scores for attitudes, subjective norms, perceived susceptibility, perceived severity, perceived benefits, and knowledge. The next highest scores belonged to those that had been partially vaccinated, with those that had never started the series having the

lowest scores. Interestingly, perceived severity always had mean scores higher than perceived susceptibility, no matter the vaccination status. As described by Murdock et al. (2017), even if an individual views something as severe, this does not always translate into feeling vulnerable to it. This is an important concept to keep in mind when developing messages for this population. A message could emphasize the severity of HPV and still not be successful unless an individual feels susceptible to HPV. While many of these predictors were included as segmenting variables, differences in uptake related to demographic characteristics need to be further explored. Biological sex is unsurprising as a predictor, since for a time the HPV vaccine was only recommended for females. Females of all ages still have higher rates of vaccination than males (Boersma 2020). However, the impact of gender identity often influences whether a healthcare provider will give a recommendation for the HPV vaccine. Bednarczyk et al. (2017) found differences in receipt of recommendation based upon gender identity and suggests that providers give recommendations based upon age instead of biological sex at birth. Since a provider recommendation is often the number one predictor of vaccination, providers must take into account that making recommendations based upon biological sex assigned at birth is not enough. Race was also found to be a key predictor of intention to vaccinate. Race and ethnicity have a significant effect on vaccination rates (Boersma 2020, Kellogg 2019) Kellogg et al. (2019) found that Hispanic young adults were less likely to be vaccinated compared to non-Hispanic young adults. Boersma and Black (2020) found that white young adults had the highest rates of vaccine initiation, followed by non-Hispanic Black young adults and then Hispanic young adults. Ylitalo et al. (2013) found that while receiving a recommendation was a strong predictor of

vaccination, racial and ethnic minorities were less likely to receive a recommendation from a healthcare provider. As stated throughout this study, a provider recommendation is critical to vaccination and everyone, regardless of race, ethnicity, gender identity, or other demographics, needs to receive a recommendation for this vaccine.

The goal of this study was to identify existing segments within the 18-26 year old population and determine messaging strategies that may be successful in improving HPV vaccination coverage. In addition to a control message, nine messages were tested including one facts-based message, five Murdock style messages focusing on the social or health consequences of HPV, one personal story message, one fear tactic message, and one message focusing on anticipated regret. As this study shows, one message does not work for all segments. There are certainly more popular messages that significantly increased intentions in multiple segments, such as messages 4, 6, & 10. Message 4 emphasizes the health consequences of genital warts caused by HPV. Message 6 emphasizes the health consequences of cancer caused by HPV. Message 10 focuses on cancer and anticipated regret. Messaging focusing on the negative health outcomes of HPV have been successfully used in the past to influence intentions to vaccinate (Gerend & Shepherd 2007, Krakow et al., 2017, Vorpahl & Yang 2018). Murdock et al. (2017) found that emphasizing the social consequences versus health consequences of an outcome resulted in greater perceived vulnerability and intentions. Both messages highlighting the social and health consequences of HPV were successful in increasing baseline intentions to vaccinate as well as hypothetically influencing intentions to vaccinate. Anticipated regret was tested within a didactic message format. Kim (2020) found didactic messages involving anticipated regret to be more successful than narrative

messages involving anticipated regret. A narrative message was not tested within this study, but the message involving anticipated regret was one of the top performers.

While identifying message responses by segment, the message(s) found to significantly increase intention within each segment may not have been the message(s) self-reported as most influential. There are two possible reasons for this inconsistency. First, participants were randomized to a particular message at the beginning of the survey. Not all members of a segment viewed the same message. Second, towards the end of the survey, all ten messages were presented randomly to participants. They were able to read each message and think about which one would influence them the most. It is also possible that participants selected messages that they thought would influence them to get the vaccine, but in reality, may or may not significantly impact intention. The messages that were able to significantly increase intentions when tested in the pre/post design at the beginning of the survey have more weight within this study.

Among all messaging styles, the second facts-based message, anticipated regret message, and Murdock style messages were the most commonly selected as influential in vaccine acceptance. Murdock et al. (2017), suggested the need for future research to test a financial consequences message. Message 7 was developed to test this, and Segment #2 rated this message highest in its ability to influence them to vaccinate. Segment #2 was the segment facing the highest access barriers, of which cost was included. Rambout et al. (2014) found that cost was a barrier for HPV vaccination in young women. It makes sense that the potential cost of a health outcome such as HPV-related cancer could also work as a facilitator for vaccination, especially those with high cost barriers already. The goal is to avoid cost—so if the cost of the HPV vaccine is less than the cost of HPV-

related cancer treatment, intentions to receive the vaccine would most likely increase. Overall, based upon these results, Murdock style messages emphasizing the negative social, health, or financial consequences of a health outcome should be embraced and further tested to explore impact on HPV vaccine uptake.

Message 9 was not selected for anyone as likely to influence intentions to vaccinate. Message 9 was the fear tactic message emphasizing that HPV could lead to cancer and ultimately death. It was expected that some participants, even a small amount, would like this message. During the qualitative interviews, a few participants mentioned that a fear type message was their preference. The fact that no one selected the fear based message was a surprising result.

All segments rated doctors as their most trusted source of information regarding the HPV vaccine. Griffin et al. (2018) also found that adolescents trusted information from physicians higher than parents and religious leaders. However, Cooper et al. (2017) found racial and ethnic differences in trust of HPV information coming from providers, with Hispanic adult men being less likely to trust information compared to white and Black adult men. Other highly trusted sources of information included Pharmacists, Nurses, Physician's Assistants, Nurse Practitioners, the CDC, and the WHO. Some of the least trusted sources of information included dentists, dental hygienists, pharmaceutical companies, the U.S. government, and friends or family members. It is interesting to note that Segments #2 and #3 trusted a dentist less than a dental hygienist. While trust is an extremely important part of shared decision-making, other factors are involved as well. For example, Segment #1 has the highest norms yet rated close friends as one of the least trusted sources of information. Just because a source is not fully trusted does not mean

that it will fail to have an influence on the decision. As Hirth et al. (2019) found, individuals within this age group often rely on family, sexual partners, and healthcare providers to help them make decisions about HPV vaccination. Pharmaceutical companies were often rated as one of the least trusted sources of information. Trust in the pharmaceutical industry has been declining in recent years (Bauchner et al., 2018). Fogel et al. (2018) compared trust levels across various forms of pharmaceutical direct-to-consumer advertisements for prescription medications. They found that Twitter and print advertisements were associated with higher levels of trust compared with television advertisements. This study only evaluated general trust in advertisement information coming from the pharmaceutical companies. Future research may evaluate different methods of advertising used by pharmaceutical companies to determine which method of advertising is most trusted by consumers.

Future HPV messaging campaigns and one-on-one conversations can be informed by the segments identified in this study and targeted to each segments' unique barriers to HPV vaccine acceptance. Instead of having a one size fits all message, there needs to be greater variety and an intentional approach in the messaging strategy. Gerend et al. (2013) found that when college aged females read a message tailored to their unique barriers, intentions reported were greater than those who read a non-tailored message. While this approach requires greater resources and time in addition to presenting logistical challenges, identifying which segment an individual belongs to may aid in message choice and strategy. All six segments faced unique barriers that can be addressed, and every segment had its own preferences for which messages they liked and which messages were successful in increasing intention.

Limitations

The biggest limitation of this study is that intentions to vaccinate were measured instead of actual uptake. Intention does not directly translate to behavior change, but is the best predictor of behavior change that is currently available. Due to limited funding, the sample size for the segmentation analysis and message testing was smaller than anticipated. A larger sample size would have been more ideal. This can be addressed in a future study. All messages were developed prior to the segmentation analysis. The original plan was to conduct the segmentation analysis and then create messages based upon the segments that existed. Rich information was still gained even by creating the messages prior to the segmentation, but it required a lot of guess work and reliance upon the interview results. Vaccination status was self-reported and may not be completely accurate. For vaccination status, there had to be a way to consider the 2016 change that allowed an individual to receive two doses prior to age 15 and be considered 'complete' versus three doses. Having participants reflect on age at vaccination may have led to inaccurate results. Recall bias in general is important to keep in mind for surveys such as this one. Another factor to keep in mind is social desirability bias, where participants answer in a way that they feel is socially desirable even if they do not actually feel that way.

Future Directions

Future research should test both the segmentation analysis and the messages across a larger and more diverse sample size. For this study, messages were developed prior to segmentation analysis. Although quite a few messages were found to be successful in increasing intention to vaccinate, new messages based upon results of the

segmentation analysis and the specific preferences each segment has should be created and evaluated in terms of not only intention but also uptake. The self-selected messages should be tested in the future to determine whether they do in fact influence intentions to vaccinate. Most messages were general in their approach, and some segments would benefit from having more detail provided that addresses their concerns. Each segment has unique characteristics and preferences related to the HPV vaccine. It would be interesting to do a study involving healthcare providers identifying which segments their patients belonged to and then tailoring HPV vaccine messaging based upon this information, all with the end goal of vaccination. A checklist would need to be developed allowing providers to identify which segment their patient belonged to. Providers may even need to have their patients answer a few questions relating to the key segmenting variables of subjective norms, knowledge, attitudes, and perceived susceptibility in order to determine which segment a patient belongs to. Hypothetical conversations between provider and patient could be developed and tested. Conversations and other forms of message delivery such as brochures, pamphlets, or other print sources could be compared. This could be in the form of a Randomized Controlled Trial measuring actual uptake of the HPV vaccine after segment identification and associated message delivery.

This study defined segments based upon key barriers to HPV vaccine uptake in addition to the unique health-decision making processes of each segment. Future research should attempt to define the segments further through identification of observable traits or behaviors. As discussed previously, a presumptive approach to vaccine recommendation is associated with higher rates of vaccine acceptance (Kempe et al., 2019). Healthcare providers should use presumptive or announcement approaches to

HPV vaccine recommendation, brief statements or messages that assume vaccine acceptance. If the patient is hesitant, the healthcare provider can listen reflectively and ask open-ended questions to understand what barriers the patient faces. This dialogue can be an opportunity to not only determine which segment a patient belongs to, but also gives the healthcare provider the opportunity to address key barriers and understand what the patient is thinking about the HPV vaccine (Brewer et al., 2017, Opel et al. 2013). Motivational interviewing has been used successfully to improve provider communication and HPV vaccine acceptance among parents (Reno et al., 2018). Assessing barriers specific to the patient and identifying solutions is the goal.

Overall Conclusions

HPV vaccination is a complex, multi-layered issue that requires everyone—parents, sexual partners, friends, healthcare providers, payers, and the actual patient—to be on the same page. This relates to the American Pharmacists Association's immunization neighborhood concept, where all immunization stakeholders in a community address immunization needs through collaboration, coordination, and communication (Rothholz et al., 2017). Correct and complete information about HPV, what it causes, and how the vaccine works, is essential. Risk perception, or perceived susceptibility, plays an important role and needs to be addressed. Even if an individual feels that they are currently not at risk, they need to be presented with various scenarios that may influence their view on risk in the long-term. Cues to action continues to be extremely important, with a doctor recommendation often being the number one predictor of vaccination.

From this study, six segments with different barriers and unique preferences for HPV messaging were identified. It is safe to say that one message does not have the power to influence all. It will be essential for providers to think about which segment a patient belongs to and use this information to guide them on how to influence a patient's intention to get the HPV vaccine and complete the series.

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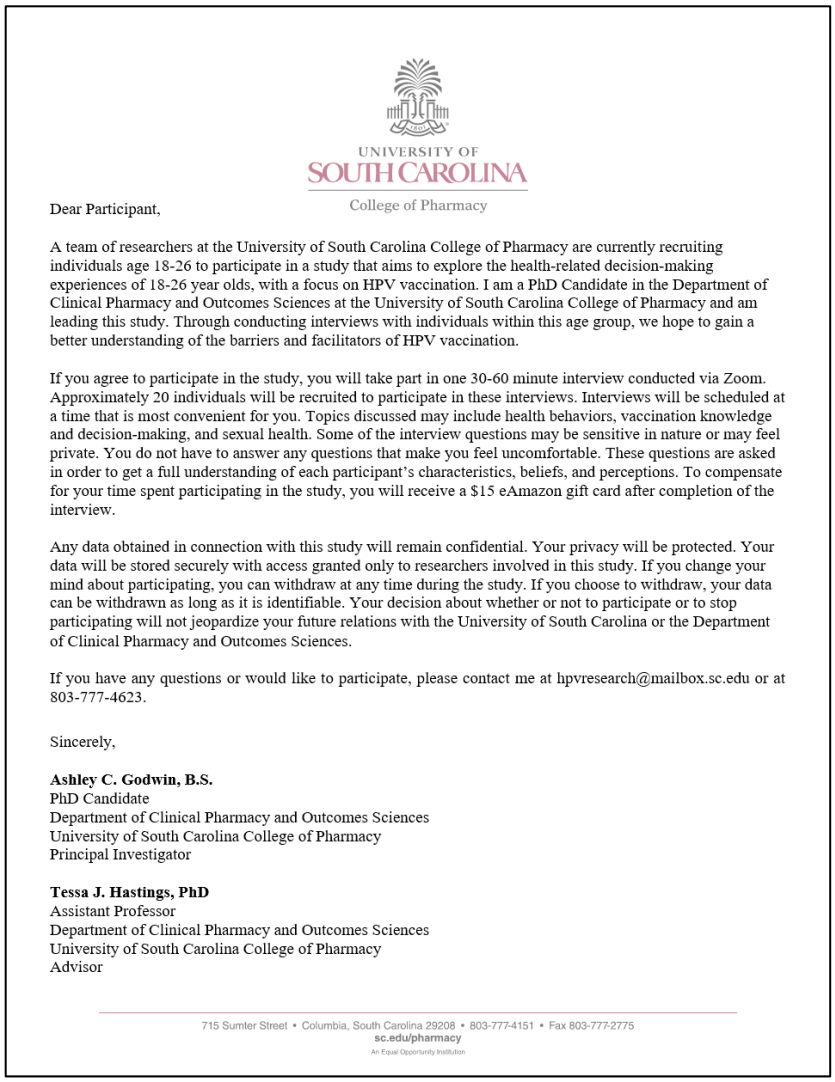
APPENDIX A

AIM 1 RECRUITMENT FLYER

Figure A.1. Aim 1 Recruitment Flyer

APPENDIX B

AIM 1 INVITATION LETTER



UNIVERSITY OF
SOUTH CAROLINA
College of Pharmacy

Dear Participant,

A team of researchers at the University of South Carolina College of Pharmacy are currently recruiting individuals age 18-26 to participate in a study that aims to explore the health-related decision-making experiences of 18-26 year olds, with a focus on HPV vaccination. I am a PhD Candidate in the Department of Clinical Pharmacy and Outcomes Sciences at the University of South Carolina College of Pharmacy and am leading this study. Through conducting interviews with individuals within this age group, we hope to gain a better understanding of the barriers and facilitators of HPV vaccination.

If you agree to participate in the study, you will take part in one 30-60 minute interview conducted via Zoom. Approximately 20 individuals will be recruited to participate in these interviews. Interviews will be scheduled at a time that is most convenient for you. Topics discussed may include health behaviors, vaccination knowledge and decision-making, and sexual health. Some of the interview questions may be sensitive in nature or may feel private. You do not have to answer any questions that make you feel uncomfortable. These questions are asked in order to get a full understanding of each participant's characteristics, beliefs, and perceptions. To compensate for your time spent participating in the study, you will receive a $15 eAmazon gift card after completion of the interview.

Any data obtained in connection with this study will remain confidential. Your privacy will be protected. Your data will be stored securely with access granted only to researchers involved in this study. If you change your mind about participating, you can withdraw at any time during the study. If you choose to withdraw, your data can be withdrawn as long as it is identifiable. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with the University of South Carolina or the Department of Clinical Pharmacy and Outcomes Sciences.

If you have any questions or would like to participate, please contact me at hpvresearch@mailbox.sc.edu or at 803-777-4623.

Sincerely,

Ashley C. Godwin, B.S.
PhD Candidate
Department of Clinical Pharmacy and Outcomes Sciences
University of South Carolina College of Pharmacy
Principal Investigator

Tessa J. Hastings, PhD
Assistant Professor
Department of Clinical Pharmacy and Outcomes Sciences
University of South Carolina College of Pharmacy
Advisor

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Figure B.1. Aim 1 Invitation Letter

APPENDIX C

AIM 1 INTERVIEW SCRIPT

Welcome 2 MINUTES

- Ashley Introduction
- Explain aim of study (learn more about experiences of college students with the HPV vaccine)
- Sensitive Subject Matter (e.g., HPV, sex, cancer)
- Promise of Confidentiality
- Audio tape only for benefit of Ashley to transcribe, interviews will be de-identified

- Respondent Introduction (keep this short as **screener** captures most) 5 MINUTES
  - Icebreaker: Tell me a little about yourself Are you in school? Working? in a relationship? What do you do for fun?
- **For those previously VACCINATED (completed or partial):**
- Let's talk a bit more about Health 10 MINUTES
  - How frequently do you go to the doctor?
    i. How you manage your overall health?
    ii. What about your sexual health?

iii. What about any kind of preventative healthcare?

- Tell me about your past experiences with vaccinations.
    i. When was the last time you got the flu shot?

- Are you currently in a relationship?

- Are you sexually active?
    i. If NO:
        - have you ever been?
        - Do you plan to be in the near future?
    ii. If YES, What do you think your risk is for a sexually transmitted infection/disease?
    iii. If YES, What about your partner's risk for a sexually transmitted infection?
    iv. If YES, Do you use protection?

- HPV knowledge
    i. What do you know about HPV? What are your thoughts on HPV?
    ii. How did you learn about it? (where did they get information)
    iii. Do you have any personal experiences related to HPV? **(TPB Attitudes)**
        - Know someone who had it? Etc.

iv. Do you feel like you are at risk? Why or why not? **(HBM Susceptibility)**

v. Do you feel that others are more or less at risk for contracting the HPV virus/infection? Why? (ex. males)

vi. What do you think the chance is that HPV turns cancer?

vii. What can people do to prevent HPV and HPV-related cancer?

- What do you know about the HPV vaccine?
    i. Have any of your friends gotten the vaccine? **(TPB Subjective Norms)**

- <u>Path to Purchase</u>

  <u>MINUTES</u>

    - You said you had gotten the HPV vaccine. Was this vaccine recommended to you? **(HBM Cues to Action)**
        i. If so, by whom?

    - What age were you when you first got the HPV vaccine?
        i. Did you complete the series?
        ii. If not, why not?

    - Tell me more about what made you initially get this vaccine?

i. Whose decision was it? **(HBM Self-Efficacy/TPB Perceived Behavioral Control?)**

ii. What role did parents/friends/others in decision making process? **(TPB Subjective Norms/Perceived Behavioral Control)**

iii. Did you go to the doctor to request it? OR did doctor (or other healthcare professional) recommend it?

iv. Did you get it right away? Or did you have to come back later after making an appt?

v. Did you do any research or ask questions before getting it?

- If yes, what kind of research? What questions did you ask? What sources did you use?

vi. When you were thinking about getting this vaccine, what did you think were the benefits of getting the vaccine? **(HBM Benefits/TPB Attitudes)**

vii. Were there any barriers to getting the vaccine? **(HBM Barriers/TPB Perceived Behavioral Control)**

- Insurance, cost issues, scheduling…

viii. ***for those that only completed a few doses…what prevented you from completing all recommended doses?***

ix. How do you feel about the decision to get this vaccine?

- Would you recommend the HPV vaccine to a friend? A daughter or son in the future? **(TPB Subjective Norms)**

- Looking back, what would have encouraged you even more to get the vaccine? For example, what would have swayed you to get the vaccine in addition to the factors that made you get it in the first place? **(HBM Cues to Action)**
    i. Endorsement by an MD? Celebrity? Friend?
    ii. More information? What kind of information?
    iii. Specific messaging?
    iv. If the process was easier?

- Wrap-Up 2 MINUTES
    - If you could change one thing about the HPV vaccine and the process for getting it, what would it be? **(HBM Self Efficacy – possibly / HBM Barriers/TPB Perceived Behavioral Control)**

Closing: Thank you for your time today. It was a pleasure meeting you. If you have any questions, please feel free to reach out in the future.

For those previously UNVACCINATED:

1. Let's talk a bit more about Health MINUTES

a. How frequently do you go to the doctor?
    i. What causes you to go to the doctor?
    ii. How you manage your overall health?
    iii. What about your sexual health?
    iv. What about any kind of preventative healthcare?

b. Tell me about your past experiences with vaccinations.
    i. When was the last time you got the flu shot?

c. Are you in a relationship?

d. Are you sexually active?
    i. If NO:
        1. have you ever been?
        2. Do you have plans to be in the near future?
    ii. If yes, What do you think your risk is for a sexually transmitted infection/disease?
    iii. What about your partner's risk for a sexually transmitted infection?
    iv. Do you use protection?

e. Have you heard of HPV?
    i. Knowledge level—What do you know about it?
    ii. How did you learn about it? (information source, etc.)

iii. Do you have any personal experiences related to HPV? (Know someone who had it? Etc.)

iv. Do you feel like you are at risk? Why or why not?

1. .

v. Do you feel that others are more or less at risk for contracting the HPV virus? Why? (ex. males)

vi. What do you think the chance is that HPV turns cancer?

vii.

viii. What can people do to prevent HPV and HPV-related cancer?

f. Have you heard about the HPV vaccine?

i. What do you know about it?

ii. Have any of your friends gotten the vaccine? Or anyone you know?

2. <u>Path to Purchase</u>

<u>10 MINUTES</u>

a. Has the HPV vaccine ever been recommended to you?

i. If so, by whom?

b. What are your reasons for not getting the vaccine?

i. Whose decision was it?

ii. What role did parents/friends/others in the decision making process?

iii. Did you do any research or ask questions?

iv. Do you think there are any benefits to getting the vaccine?

v. What about barriers? Were there any barriers that prevented you from getting the vaccine? Or any barriers that make it harder for you to get the vaccine in the future?

1. Insurance, cost issues, scheduling…

vi. How do you feel about the decision to NOT get this vaccine **(TPB Intentions)**

c. Is there anything that would encourage you to get the vaccine? **(TPB Intentions/HBM Cues to Action/TPB Subjective Norms—possibly)**

i. Endorsement by an MD? Celebrity? Friend?

ii. More information? What kind of information?

iii. Specific messaging?

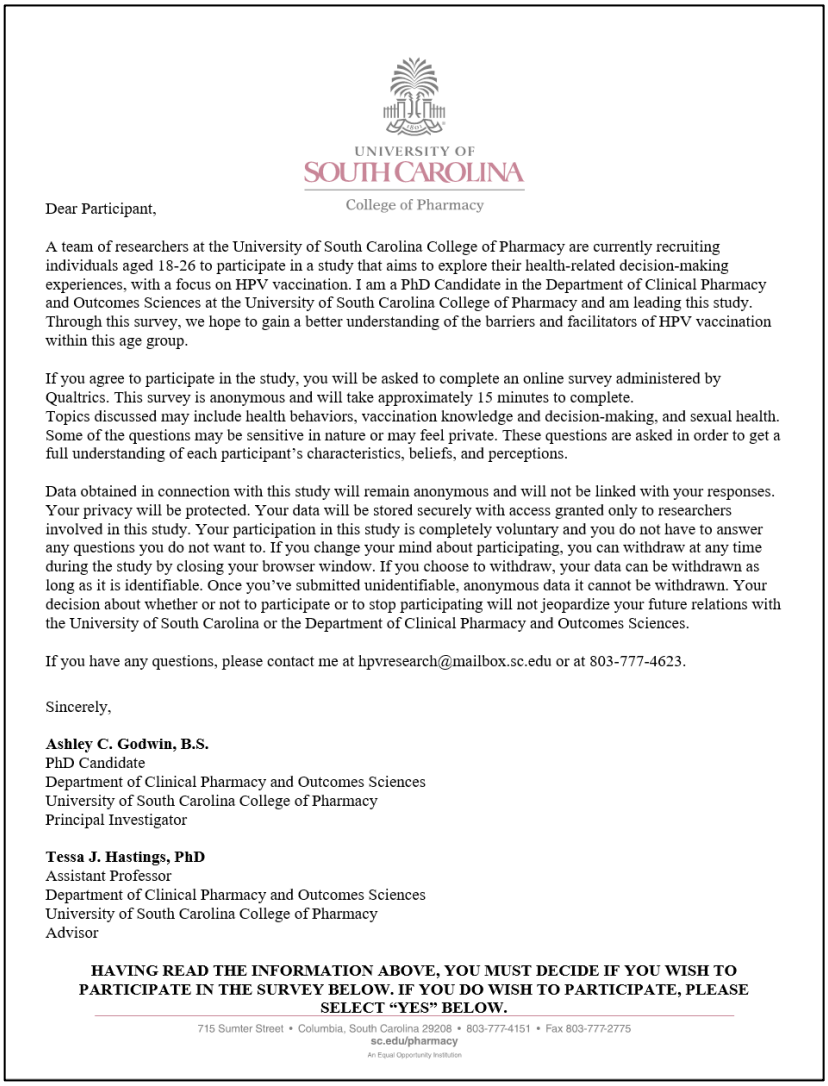
iv. If the process was easier?

3. Wrap-Up 2 MINUTES

Closing: Thank you for your time today. It was a pleasure meeting you. If you have any questions, please feel free to reach out in the future.

APPENDIX D

AIM 2 INVITATION LETTER



UNIVERSITY OF
SOUTH CAROLINA
College of Pharmacy

Dear Participant,

A team of researchers at the University of South Carolina College of Pharmacy are currently recruiting individuals aged 18-26 to participate in a study that aims to explore their health-related decision-making experiences, with a focus on HPV vaccination. I am a PhD Candidate in the Department of Clinical Pharmacy and Outcomes Sciences at the University of South Carolina College of Pharmacy and am leading this study. Through this survey, we hope to gain a better understanding of the barriers and facilitators of HPV vaccination within this age group.

If you agree to participate in the study, you will be asked to complete an online survey administered by Qualtrics. This survey is anonymous and will take approximately 15 minutes to complete.
Topics discussed may include health behaviors, vaccination knowledge and decision-making, and sexual health. Some of the questions may be sensitive in nature or may feel private. These questions are asked in order to get a full understanding of each participant's characteristics, beliefs, and perceptions.

Data obtained in connection with this study will remain anonymous and will not be linked with your responses. Your privacy will be protected. Your data will be stored securely with access granted only to researchers involved in this study. Your participation in this study is completely voluntary and you do not have to answer any questions you do not want to. If you change your mind about participating, you can withdraw at any time during the study by closing your browser window. If you choose to withdraw, your data can be withdrawn as long as it is identifiable. Once you've submitted unidentifiable, anonymous data it cannot be withdrawn. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with the University of South Carolina or the Department of Clinical Pharmacy and Outcomes Sciences.

If you have any questions, please contact me at hpvresearch@mailbox.sc.edu or at 803-777-4623.

Sincerely,

Ashley C. Godwin, B.S.
PhD Candidate
Department of Clinical Pharmacy and Outcomes Sciences
University of South Carolina College of Pharmacy
Principal Investigator

Tessa J. Hastings, PhD
Assistant Professor
Department of Clinical Pharmacy and Outcomes Sciences
University of South Carolina College of Pharmacy
Advisor

HAVING READ THE INFORMATION ABOVE, YOU MUST DECIDE IF YOU WISH TO PARTICIPATE IN THE SURVEY BELOW. IF YOU DO WISH TO PARTICIPATE, PLEASE SELECT "YES" BELOW.

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Figure D.1. Aim 2 Invitation Letter

APPENDIX E

AIM 2 SURVEY

Start of Block: Introduction
Q64 Do you wish to participate in this survey?

- ○ Yes (1)
- ○ No (2)

Start of Block: Screener
Q5 Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix)

- ○ Yes (1)
- ○ No (2)
- ○ Not sure (3)

Skip To: Q12 If Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = Not sure
Skip To: Q6 If Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = Yes
Skip To: Q12 If Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = No
Q6 How many doses/shots of the HPV vaccine did you receive?

- ○ One (1)
- ○ Two (2) Three (3)

Q8 How old do you think you were when you got the HPV vaccine?

- ○ 9-14 years old (1)
- ○ 15-18 years old (2)
- ○ 19-22 years old (3)
- ○ 23-26 years old (4)

Q12 How old are you now?

_____

Q27 What is your biological sex assigned at birth?

- ○ Male (1)

○ Female (2)

End of Block: Screener

Start of Block: Intention to Vaccinate (for those who haven't completed series)

Display This Question:

If Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = No
Or If
Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = Not sure
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 15-18 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 19-22 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 23-26 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = One

Q58 Please answer the following questions about your likelihood to do the following items within the next year.

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)
How likely is it that you'll try to get information about the HPV vaccine? (1)	○	○	○	○	○
How likely is it that you'll consider getting the HPV vaccine? (2)	○	○	○	○	○
How likely is it that you'll try to get the HPV vaccine? (3)	○	○	○	○	○

How likely is it that you'll actually get the HPV vaccine? (4)	○	○	○	○	○
If a doctor offered you the HPV vaccine within the next year, how likely is it that you'd get vaccinated? (5)	○	○	○	○	○

End of Block: Intention to Vaccinate (for those who haven't completed series)

Start of Block: Randomized Message #1
Display This Question:
If Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = No
Or Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = Not sure
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 15-18 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 19-22 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 23-26 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = One
Q63
Please read the message below:
HPV is a common virus. It's estimated that more than 85% of all sexually active adults become infected with HPV in their lifetime. For most people, HPV clears on its own. But for others that don't clear the virus, HPV could lead to certain cancers in both men and women. There is no way to know which patients who have HPV will develop cancer.
Based upon the message you just read, answer the following questions about your likelihood to do the following items within the next year.

	Extremely	Somewhat	Neither	Somewhat	Extremely

	unlikely (1)	unlikely (2)	likely nor unlikely (3)	likely (4)	likely (5)
How likely is it that you'll try to get information about the HPV vaccine? (1)	○	○	○	○	○
How likely is it that you'll consider getting the HPV vaccine? (2)	○	○	○	○	○
How likely is it that you'll try to get the HPV vaccine? (3)	○	○	○	○	○
How likely is it that you'll actually get the HPV vaccine? (4)	○	○	○	○	○
If a doctor offered you the HPV vaccine within the next year, how likely is it that you'd get vaccinated? (5)	○	○	○	○	○

End of Block: Randomized Message #1
Start of Block: Randomized Message #2
Display This Question:
If Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = No
Or Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = Not sure
Or How many doses/shots of the HPV vaccine did you receive? = One
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 15-18 years old
Or If

How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 19-22 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 23-26 years old
Q64
Please read the message below:
The HPV vaccine can help you protect yourself and others from HPV-related cancers. It has minimal side effects and could prevent more than 90% of HPV-related cancers. The HPV vaccine is recommended for both men and women through age 26. If you haven't yet received the vaccine, it's not too late! Get the HPV vaccine today.

Based upon the message you just read, answer the following questions about your likelihood to do the following items within the next year.

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)
How likely is it that you'll try to get information about the HPV vaccine? (1)	○	○	○	○	○
How likely is it that you'll consider getting the HPV vaccine? (2)	○	○	○	○	○
How likely is it that you'll try to get the HPV vaccine? (3)	○	○	○	○	○
How likely is it that you'll actually get the HPV vaccine? (4)	○	○	○	○	○
If a doctor offered you the HPV vaccine within the next	○	○	○	○	○

year, how likely is it that you'd get vaccinated? (5)	

End of Block: Randomized Message #2
Start of Block: Randomized Message #3
Display This Question:
If Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = No
Or Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = Not sure
Or How many doses/shots of the HPV vaccine did you receive? = One
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 15-18 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 19-22 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 23-26 years old
Q65
Please read the message below:
HPV can cause genital warts, which can make you feel ugly and unattractive and adversely affect your social life. Get the HPV vaccine today to protect yourself and others from HPV.

Based upon the message you just read, answer the following questions about your likelihood to do the following items within the next year.

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)
How likely is it that you'll try to get information about the HPV vaccine? (1)	○	○	○	○	○
How likely is it that you'll consider getting the HPV vaccine? (2)	○	○	○	○	○

How likely is it that you'll try to get the HPV vaccine? (3)	○	○	○	○	○
How likely is it that you'll actually get the HPV vaccine? (4)	○	○	○	○	○
If a doctor offered you the HPV vaccine within the next year, how likely is it that you'd get vaccinated? (5)	○	○	○	○	○

End of Block: Randomized Message #3
Start of Block: Randomized Message #4
Display This Question:
If Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = No
Or Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = Not sure
Or How many doses/shots of the HPV vaccine did you receive? = One
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 15-18 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 19-22 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 23-26 years old
Q66
Please read the message below:
HPV can cause genital warts, which can cause discomfort and itching and can adversely affect your health. Get the HPV vaccine today to protect yourself and others from HPV.
Based upon the message you just read, answer the following questions about your likelihood to do the following items within the next year.

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)

How likely is it that you'll try to get information about the HPV vaccine? (1)	○	○	○	○	○
How likely is it that you'll consider getting the HPV vaccine? (2)	○	○	○	○	○
How likely is it that you'll try to get the HPV vaccine? (3)	○	○	○	○	○
How likely is it that you'll actually get the HPV vaccine? (4)	○	○	○	○	○
If a doctor offered you the HPV vaccine within the next year, how likely is it that you'd get vaccinated? (5)	○	○	○	○	○

End of Block: Randomized Message #4
Start of Block: Randomized Message #5
Display This Question:
If Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = No
Or Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = Not sure
Or How many doses/shots of the HPV vaccine did you receive? = One
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 15-18 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 19-22 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two

And How old do you think you were when you got the HPV vaccine? = 23-26 years old
Q67
Please read the message below:
HPV can cause cancer, which can make you feel isolated and depressed and can adversely affect your social life. Get the HPV vaccine today to protect yourself and others from HPV.
Based upon the message you just read, answer the following questions about your likelihood to do the following items within the next year.

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)
How likely is it that you'll try to get information about the HPV vaccine? (1)	○	○	○	○	○
How likely is it that you'll consider getting the HPV vaccine? (2)	○	○	○	○	○
How likely is it that you'll try to get the HPV vaccine? (3)	○	○	○	○	○
How likely is it that you'll actually get the HPV vaccine? (4)	○	○	○	○	○
If a doctor offered you the HPV vaccine within the next year, how likely is it that you'd get	○	○	○	○	○

vaccinated? (5)	

End of Block: Randomized Message #5
Start of Block: Randomized Message #6
Display This Question:
If Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = No
Or Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = Not sure
Or How many doses/shots of the HPV vaccine did you receive? = One
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 15-18 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 19-22 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 23-26 years old
Q68
Please read the message below:
HPV can cause cancer, damaging your cells and weakening your immune system, and can adversely affect your health. Get the HPV vaccine today to protect yourself and others from HPV.
Based upon the message you just read, answer the following questions about your likelihood to do the following items within the next year.

	Extremely likely (1)	Somewhat likely (2)	Neither likely nor unlikely (3)	Somewhat unlikely (4)	Extremely unlikely (5)
How likely is it that you'll try to get information about the HPV vaccine? (1)	○	○	○	○	○
How likely is it that you'll consider getting the HPV vaccine? (2)	○	○	○	○	○
How likely is it that you'll try to get the	○	○	○	○	○

HPV vaccine? (3)					
How likely is it that you'll actually get the HPV vaccine? (4)	○	○	○	○	○
If a doctor offered you the HPV vaccine within the next year, how likely is it that you'd get vaccinated? (5)	○	○	○	○	○

End of Block: Randomized Message #6
Start of Block: Randomized Message #7
Display This Question:
If Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = No
Or Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = Not sure
Or How many doses/shots of the HPV vaccine did you receive? = One
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 15-18 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 19-22 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 23-26 years old
Q69
Please read the message below:
HPV can cause cancer, often requiring chemotherapy, radiation, or surgery, and costing you thousands of dollars. Get the HPV vaccine today to protect yourself and others from HPV.
Based upon the message you just read, answer the following questions about your likelihood to do the following items within the next year.

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)

How likely is it that you'll try to get information about the HPV vaccine? (1)	○	○	○	○	○
How likely is it that you'll consider getting the HPV vaccine? (2)	○	○	○	○	○
How likely is it that you'll try to get the HPV vaccine? (3)	○	○	○	○	○
How likely is it that you'll actually get the HPV vaccine? (4)	○	○	○	○	○
If a doctor offered you the HPV vaccine within the next year, how likely is it that you'd get vaccinated? (5)	○	○	○	○	○

End of Block: Randomized Message #7
Start of Block: Randomized Message #8
Display This Question:
If Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = No
Or Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = Not sure
Or How many doses/shots of the HPV vaccine did you receive? = One
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 15-18 years old

Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 19-22 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 23-26 years old

Q70 Please read the message below:
'I had no idea that HPV could cause cancer in both men and women. I got an HPV-related cancer and almost died. I didn't even know that I could have gotten the vaccine and protected myself." Don't let this story be your story. Get the vaccine today to protect yourself and others from HPV.
Based upon the message you just read, answer the following questions about your likelihood to do the following items within the next year.

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)
How likely is it that you'll try to get information about the HPV vaccine? (1)	○	○	○	○	○
How likely is it that you'll consider getting the HPV vaccine? (2)	○	○	○	○	○
How likely is it that you'll try to get the HPV vaccine? (3)	○	○	○	○	○
How likely is it that you'll actually get the HPV vaccine? (4)	○	○	○	○	○
If a doctor offered you the HPV	○	○	○	○	○

vaccine within the next year, how likely is it that you'd get vaccinated? (5)	

End of Block: Randomized Message #8
Start of Block: Randomized Message #9
Display This Question:
If Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = No
Or Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = Not sure
Or How many doses/shots of the HPV vaccine did you receive? = One
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 15-18 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 19-22 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 23-26 years old
Q71
Please read the message below:
HPV can cause cancer in both men and women. If you don’t get the HPV vaccine, you are at risk for getting HPV, which can lead to cancer, and ultimately, death. Get the HPV vaccine today to protect yourself and others from HPV.
Based upon the message you just read, answer the following questions about your likelihood to do the following items within the next year.

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)
How likely is it that you'll try to get information about the HPV vaccine? (1)	○	○	○	○	○
How likely is it that you'll consider	○	○	○	○	○

getting the HPV vaccine? (2)					
How likely is it that you'll try to get the HPV vaccine? (3)	○	○	○	○	○
How likely is it that you'll actually get the HPV vaccine? (4)	○	○	○	○	○
If a doctor offered you the HPV vaccine within the next year, how likely is it that you'd get vaccinated? (5)	○	○	○	○	○

End of Block: Randomized Message #9
Start of Block: Randomized Message #10
Display This Question:
If Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = No
Or Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = Not sure
Or How many doses/shots of the HPV vaccine did you receive? = One
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 15-18 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 19-22 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 23-26 years old
Q72
Please read the message below:
The HPV vaccine protects both men and women from developing HPV-related cancers later in life. Imagine how you would feel if you got an HPV-related cancer and realized

that you could have prevented it? Get the HPV vaccine today to protect yourself and others from HPV.

Based upon the message you just read, answer the following questions about your likelihood to do the following items within the next year.

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)
How likely is it that you'll try to get information about the HPV vaccine? (1)	○	○	○	○	○
How likely is it that you'll consider getting the HPV vaccine? (2)	○	○	○	○	○
How likely is it that you'll try to get the HPV vaccine? (3)	○	○	○	○	○
How likely is it that you'll actually get the HPV vaccine? (4)	○	○	○	○	○
If a doctor offered you the HPV vaccine within the next year, how likely is it that you'd get vaccinated? (5)	○	○	○	○	○

End of Block: Randomized Message #10

Start of Block: Health Behaviors (Starts off with Gould's HCS)
Q79 The next set of questions relates to health behaviors and attitudes.
Q54 Do you have health insurance?

- Yes (1)
- No (2)
- Not anymore (3)
- Not sure (4)

Display This Question:
If Do you have health insurance? = Yes
Q105 What insurance do you currently have?

- Private insurance (my own policy) (1)
- Private insurance (my parent's/ guardian's policy) (2)
- School health insurance (3)
- Medicare (4)
- Medicaid (5)
- Tricare (6)
- Other (Please specify): (7) _____

Q48 When was the last time you saw a doctor?

- Within the past 0-3 months (1)
- Within the past 4-6 months (2)
- Within the past year (3)
- Over a year ago (4)

Q51 Do you have a primary care doctor?

- Yes (1)
- No (2)

Q49 What doctor do you see most regularly?

- Pediatrician (1)
- Primary Care/Family doctor (2)
- OB/GYN (3)
- Counseling/Psychiatry (4)

○ Specialist (5)

○ I don't have a regular doctor (6)

○ Other (Please Specify) (7)

_____

Page Break

Q55 Please rate your agreement with each statement below.

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
I've got to be real sick in order to go to a doctor (1)	○	○	○	○	○
I regularly go for medical check-ups (2)	○	○	○	○	○
I know enough to challenge my doctor once in a while (3)	○	○	○	○	○
Doctors using unorthodox medical treatments should be allowed to practice (4)	○	○	○	○	○
I'm not afraid to use non-traditional health care providers such as herbalists (5)	○	○	○	○	○
I don't care how	○	○	○	○	○

medicine works, I just want the doctor to fix me up when I get sick (6)					
I'll try new health behaviors but I'm not usually the first on my block to try them (7)	○	○	○	○	○
A good diet can prevent heart disease and cancer (8)	○	○	○	○	○
I keep up with the latest scientific health information (9)	○	○	○	○	○
I carefully evaluate scientific reports in the news for their truth and validity (10)	○	○	○	○	○

Page Break

Q54 Please rate your agreement with each statement below.

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
I reflect about my	○	○	○	○	○

health a lot (1)					
I'm very self-conscious about my health (2)	○	○	○	○	○
I'm generally attentive to my inner feelings about my health (3)	○	○	○	○	○
I'm constantly examining my health (4)	○	○	○	○	○
I'm alert to changes in my health (5)	○	○	○	○	○
I'm usually aware of my health (6)	○	○	○	○	○
I'm aware of the state of my health as I go through the day (7)	○	○	○	○	○
I notice how I feel physically as I go through the day (8)	○	○	○	○	○
I'm very involved with my health (9)	○	○	○	○	○

Page Break
End of Block: Health Behaviors (Starts off with Gould's HCS)
Start of Block: General HPV Knowledge
Q80 The next set of questions relates to knowledge and past experiences with HPV and the HPV vaccine.
Q57 What is your likelihood of getting one of the following at some point in your life?

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)
Sexually Transmitted Infection or Sexually Transmitted Disease (STI/STD) (1)	○	○	○	○	○
Herpes (2)	○	○	○	○	○
Chlamydia (3)	○	○	○	○	○
Gonorrhea (4)	○	○	○	○	○
HIV/AIDS (5)	○	○	○	○	○
HPV (6)	○	○	○	○	○
Genital warts (7)	○	○	○	○	○
Cancer (8)	○	○	○	○	○

Page Break

Q55 What do you know about HPV?

_____

Page Break

Q75 What do you know about the HPV vaccine?

_____

Page Break

Q62 Please rate your agreement with each statement below.

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
I feel knowledgeable about HPV (1)	○	○	○	○	○
I feel knowledgeable about the HPV vaccine (2)	○	○	○	○	○
I feel comfortable finding information about the HPV vaccine (3)	○	○	○	○	○
I feel comfortable asking my doctor or other healthcare professional about the HPV vaccine (4)	○	○	○	○	○
I feel in control of the ability to access the HPV vaccine (5)	○	○	○	○	○
I know where to go to get the HPV vaccine (6)	○	○	○	○	○

Page Break

Q53 How effective do you think the HPV vaccine is for preventing:

	Not effective at all (1)	Slightly effective (2)	Moderately effective (3)	Very effective (4)	Extremely effective (5)	Do not know (6)
Sexually Transmitted Infections or Sexually Transmitted Diseases (STI/STD) (1)	○	○	○	○	○	○
Herpes (2)	○	○	○	○	○	○
Chlamydia (3)	○	○	○	○	○	○
Gonorrhea (4)	○	○	○	○	○	○
HIV/AIDS (5)	○	○	○	○	○	○
HPV (6)	○	○	○	○	○	○
Genital warts (7)	○	○	○	○	○	○
Cancer (8)	○	○	○	○	○	○

Page Break

Display This Question:

If Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = Yes

Q61 What is the primary reason you got the HPV vaccine?

_____

Display This Question:

If How many doses/shots of the HPV vaccine did you receive? = Three

Or If

How many doses/shots of the HPV vaccine did you receive? = Two

And How old do you think you were when you got the HPV vaccine? = 9-14 years old

Q52 What made you go back to complete all doses of the HPV vaccine? (Select all that apply)

- [ ] Scheduled the appointments in advance (1)
- [ ] Reminder phone calls (2)
- [ ] Reminder texts (3)
- [ ] Doctor or other healthcare professional reminding you at the visit (4)
- [ ] Family member reminding you (5)
- [ ] Family member making the appointments for you (6)
- [ ] Family member driving you to all appointments (7)
- [ ] Friend reminding you (8)
- [ ] Other (Please specify): (9) _____

Display This Question:
If Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = No
Or Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = Not sure
Q59 What is the primary reason you did NOT get the HPV vaccine?
_____

Page Break
Display This Question:
If How many doses/shots of the HPV vaccine did you receive? = One
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 15-18 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 19-22 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 23-26 years old
Q56 What prevented you from completing the HPV vaccine series? (Select all that apply)

- [ ] Had a bad reaction (1)
- [ ] Got scared (2)
- [ ] Looked up more information (3)

- [ ] Changed my mind (4)
- [ ] A family member didn't approve (5)
- [ ] A friend didn't approve (6)
- [ ] Forgot to schedule the appointment (7)
- [ ] Moved away (8)
- [ ] Lost my health insurance (9)
- [ ] Too expensive (10)
- [ ] Other (Please specify) (11) _____

Page Break
Display This Question:
If How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 15-18 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 19-22 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 23-26 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = One
Q73 What is the primary reason you did not complete the HPV vaccine series?
_____

Page Break
End of Block: General HPV Knowledge
Start of Block: HPV Knowledge (Waller)
Q20 Please answer true or false to the following questions based upon your knowledge:

	True (1)	False (2)	Don't Know (3)
HPV is very rare (1)	○	○	○
HPV always has visible signs or symptoms (2)	○	○	○

HPV can cause cervical cancer (3)	○	○	○
HPV can cause vaginal cancer (4)	○	○	○
HPV can cause vulvar cancer (5)	○	○	○
HPV can cause anal cancer (6)	○	○	○
HPV can cause penile cancer (7)	○	○	○
HPV can cause head and neck cancer (8)	○	○	○
HPV can be passed on by genital skin-to-skin contact (9)	○	○	○
There are many types of HPV (10)	○	○	○
HPV can cause HIV/AIDS (11)	○	○	○
HPV can be passed on during sexual intercourse (12)	○	○	○

Page Break

Q87 Please answer true or false to the following questions based upon your knowledge:

	True (1)	False (2)	Don't know (3)
HPV can cause genital warts (1)	○	○	○
Men cannot get HPV (2)	○	○	○
Using condoms reduces the risk of HPV (3)	○	○	○
HPV can be cured with antibiotics (4)	○	○	○
Having many sexual partners increases	○	○	○

the risk of getting HPV (5)			
HPV usually doesn't need any treatment (6)	○	○	○
Most sexually active people will get HPV at some point in their lives (7)	○	○	○
A person could have HPV for many years and not know it (8)	○	○	○
Having sex at an early age increases the risk of getting HPV (9)	○	○	○

End of Block: HPV Knowledge (Waller)
Start of Block: HPV Vaccination Knowledge (Waller)

Q21 Please answer true or false to the following questions based upon your knowledge:

	True (1)	False (2)	Don't Know (3)
The HPV vaccine requires two to three doses depending on when you start it (1)	○	○	○
The HPV vaccine offers protection against all sexually transmitted infections (2)	○	○	○
The HPV vaccine is more effective if given to people who have never had sex (3)	○	○	○
Someone who has had the HPV vaccine cannot develop cancer (4)	○	○	○

The HPV vaccine offers protection against most cervical cancers (5)	○	○	○
The HPV vaccine offers protection against 6 HPV-related cancers (6)	○	○	○
The HPV vaccine offers protection against genital warts (7)	○	○	○
Girls who have had the HPV vaccine do not need a Pap smear test when they are older (8)	○	○	○

Page Break
End of Block: HPV Vaccination Knowledge (Waller)
Start of Block: Attention Check
Q126 Please select "Somewhat Agree" to show that you are paying attention.

- ○ Strongly Agree (1)
- ○ Somewhat Agree (2)
- ○ Neither Agree nor Disagree (3)
- ○ Somewhat Disagree (4)
- ○ Strongly Disagree (5)

Skip To: End of Block If Please select "Somewhat Agree" to show that you are paying attention. != Somewhat Agree
End of Block: Attention Check
Start of Block: Attitudes (Gerend)
Q85 The next set of questions relates to attitudes and perceptions related to HPV and the HPV vaccine.

Q22 Please rate your agreement with each statement below.

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)

Getting the HPV vaccine will help protect me from HPV infection. (1)	○	○	○	○	○
Getting the HPV vaccine will help protect me from developing HPV-related cancers. (2)	○	○	○	○	○
Getting the HPV vaccine is the right thing to do for me. (3)	○	○	○	○	○
Getting the HPV vaccine is the right thing to do for others. (4)	○	○	○	○	○
I believe there is a stigma related to the HPV vaccine. (5)	○	○	○	○	○

Page Break
End of Block: Attitudes (Gerend)
Start of Block: Subjective Norms
Q23 Please rate your agreement with each statement below.

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
My parents feel that I should get	○	○	○	○	○

the HPV vaccine. (1)					
I want to do what my parents feel is best. (2)	○	○	○	○	○
My friends feel that I should get the HPV vaccine. (3)	○	○	○	○	○
I want to do what my friends think is best. (4)	○	○	○	○	○
Getting the HPV vaccine seems to be the popular thing to do among people my age. (5)	○	○	○	○	○
I want to do what people my age are doing. (6)	○	○	○	○	○

Page Break
End of Block: Subjective Norms
Start of Block: Perceived Behavioral Control
Display This Question:
If Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = No
Or Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = Not sure
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 15-18 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 19-22 years old
Or If

How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 23-26 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = One
Q24 I feel confident that I can:

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Ask my doctor (or other healthcare professional) about getting the HPV vaccine. (1)	○	○	○	○	○
Make an appointment to get the HPV vaccine. (2)	○	○	○	○	○
Get the HPV vaccine even if I don’t like getting a shot. (3)	○	○	○	○	○
Get the HPV vaccine even if it means I need to get multiple doses. (4)	○	○	○	○	○

Page Break
End of Block: Perceived Behavioral Control
Start of Block: Perceived Susceptibility
Q61 If you don't get vaccinated for HPV, how likely is it that you'll get the following conditions in the future:

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)
Genital	○	○	○	○	○

HPV infection (1)					
HPV-related cancer (2)	○	○	○	○	○
Genital warts (3)	○	○	○	○	○

Page Break

Q62 If I don't get vaccinated for HPV, I think my chances for getting the following conditions in the future are:

	Almost zero (1)	Small (2)	Moderate (3)	Large (4)	Almost certain (5)
Genital HPV infection (1)	○	○	○	○	○
HPV-related cancer (2)	○	○	○	○	○
Genital warts (3)	○	○	○	○	○

Page Break

Q63 If I don't get vaccinated for HPV, I would feel vulnerable to the following conditions sometime in the future:

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Genital HPV infection (1)	○	○	○	○	○
HPV-related cancer (2)	○	○	○	○	○
Genital warts (3)	○	○	○	○	○

Page Break

End of Block: Perceived Susceptibility

Start of Block: Perceived Severity

Q51 Please rate your agreement with each statement below.

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Being infected with HPV would have major consequences on my life (1)	○	○	○	○	○
Having an HPV-related cancer would have major consequences on my life (2)	○	○	○	○	○
Having genital warts would have major consequences on my life (3)	○	○	○	○	○
Being infected with HPV would be devastating to me (4)	○	○	○	○	○
Having an HPV-related cancer would be devastating to me (5)	○	○	○	○	○
Having genital warts would be devastating to me (6)	○	○	○	○	○

Page Break
End of Block: Perceived Severity

Start of Block: Perceived Benefits

Q52 Please rate your agreement with each statement below.

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Getting vaccinated for HPV will help protect me from genital HPV infection. (1)	○	○	○	○	○
Getting vaccinated for HPV will help protect me from having an HPV-related cancer. (2)	○	○	○	○	○
Getting vaccinated for HPV will help protect me from having genital warts. (3)	○	○	○	○	○
If I get vaccinated for HPV, I can reduce my risk of developing HPV-related cancer. (4)	○	○	○	○	○
Getting vaccinated for HPV will decrease my chances of getting genital	○	○	○	○	○

warts. (5)	

Page Break
End of Block: Perceived Benefits
Start of Block: Perceived Barriers
Display This Question:
If Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = No
Or Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = Not sure
Or If
How many doses/shots of the HPV vaccine did you receive? = One
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 15-18 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 19-22 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 23-26 years old
Q57 To what extent are each of the following barriers to HPV vaccination?

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Cost (1)	○	○	○	○	○
Health insurance issues (2)	○	○	○	○	○
Access to the vaccine (3)	○	○	○	○	○
No extra time to get it (4)	○	○	○	○	○
Having to schedule an appointment first (5)	○	○	○	○	○
Having to schedule two to	○	○	○	○	○

three appointments to complete the series (6)					
Don't know where to get the vaccine (7)	○	○	○	○	○
Don't know how to schedule an appointment to get it (8)	○	○	○	○	○
Transportation issues (9)	○	○	○	○	○
Lack of nearby primary care doctor (10)	○	○	○	○	○
Don't feel at risk for HPV (11)	○	○	○	○	○
Currently in a committed relationship (12)	○	○	○	○	○
Not sexually active (13)	○	○	○	○	○
Parents wouldn't approve (14)	○	○	○	○	○
Friends wouldn't approve (15)	○	○	○	○	○
Shots are scary (16)	○	○	○	○	○
Hesitant about the HPV vaccine specifically (17)	○	○	○	○	○
Hesitant about vaccines in general (18)	○	○	○	○	○
Against religious beliefs	○	○	○	○	○

(19)					
Do not get vaccines (20)	○	○	○	○	○
Would have to ask questions before getting it (21)	○	○	○	○	○
Would have to do research before getting it (22)	○	○	○	○	○
Want a doctor recommendation first (23)	○	○	○	○	○
Worried about side effects (24)	○	○	○	○	○
Safety concerns about the vaccine (25)	○	○	○	○	○

Page Break
End of Block: Perceived Barriers
Start of Block: Cues to Action
Q53 Has the HPV vaccine ever been recommended to you?

- ○ Yes (1)
- ○ No (2)

Skip To: Q55 If Has the HPV vaccine ever been recommended to you? = Yes
Skip To: End of Block If Has the HPV vaccine ever been recommended to you? = No

Page Break
Q55 Who has recommended the HPV vaccine to you? (Select all that apply)

- ☐ A parent or guardian (1)
- ☐ Family member (2)
- ☐ Doctor (3)
- ☐ Physician's Assistant (PA) (4)

- ☐ Nurse Practitioner (5)
- ☐ Nurse (6)
- ☐ Pharmacist (7)
- ☐ Dentist or dental hygienist (8)
- ☐ Other healthcare professional (9)
- ☐ Friend (10)
- ☐ Other (Please specify) (11) _____

Page Break
End of Block: Cues to Action
Start of Block: Self Efficacy
Display This Question:
If Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = No
Or Have you ever gotten the HPV vaccine? (Brand Names: Gardasil, Cervavix) = Not sure
Or If
How many doses/shots of the HPV vaccine did you receive? = One
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 15-18 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 19-22 years old
Or If
How many doses/shots of the HPV vaccine did you receive? = Two
And How old do you think you were when you got the HPV vaccine? = 23-26 years old
Q56 I feel confident in my ability to:

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
To get the HPV vaccine even if it is expensive. (1)	○	○	○	○	○
To get vaccinated	○	○	○	○	○

for HPV, even if getting the shot hurts a little. (2)					
To get vaccinated for HPV, even if it means finding the time to go to the doctor three times. (3)	○	○	○	○	○

Page Break
End of Block: Self Efficacy
Start of Block: Messaging Strategies

Q84 The next set of questions relates to hypothetical messaging strategies for the HPV vaccine.
Q58 What would sway you to get the HPV vaccine? Please rate the following items on the likelihood that they would encourage you to get the HPV vaccine.

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)
A doctor recommendation (1)	○	○	○	○	○
A pharmacist recommendation (2)	○	○	○	○	○
A physician's assistant (PA) recommendation (3)	○	○	○	○	○
A nurse practitioner recommendation (4)	○	○	○	○	○

A nurse recommendation (5)	○	○	○	○	○
A dentist recommendation (6)	○	○	○	○	○
A dental hygienist recommendation (7)	○	○	○	○	○
A family member recommendation (8)	○	○	○	○	○
A friend recommendation (9)	○	○	○	○	○
A sexual partner's recommendation (10)	○	○	○	○	○
A celebrity/public figure endorsement (11)	○	○	○	○	○
A US Food and Drug Administration (FDA) recommendation (12)	○	○	○	○	○
A US government recommendation (13)	○	○	○	○	○
A Centers for Disease Control and Prevention (CDC) recommendation	○	○	○	○	○

(14)					
A World Health Organization (WHO) recommendation (15)	○	○	○	○	○
A pharmaceutical company recommendation (16)	○	○	○	○	○

Page Break

Q89 What would sway you to get the HPV vaccine? Please rate the following items on the likelihood that they would encourage you to get the HPV vaccine.

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)
A personal connection -- such as knowing someone who had it (1)	○	○	○	○	○
Knowing more about HPV (2)	○	○	○	○	○
Knowing more about what HPV causes (3)	○	○	○	○	○
Knowing that HPV can lead to 6 types of cancers affecting both men and women (4)	○	○	○	○	○

Knowing more about the HPV vaccine (5)	○	○	○	○	○
Knowing more about the clinical trials of the HPV vaccine (6)	○	○	○	○	○
Knowing about side effects of the HPV vaccine (7)	○	○	○	○	○
Knowing more about effectiveness of the HPV vaccine (8)	○	○	○	○	○
Knowing more about safety of the HPV vaccine (9)	○	○	○	○	○
More public information about HPV and the vaccine, such as a public campaign (10)	○	○	○	○	○

Page Break

Q57 What would sway you to get the HPV vaccine? Please rate the following items on the likelihood that they would encourage you to get the HPV vaccine.

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)
TV ads (1)	○	○	○	○	○

YouTube ads (2)	○	○	○	○	○
Facebook ads (3)	○	○	○	○	○
Brochures (4)	○	○	○	○	○
Posters (5)	○	○	○	○	○
Billboards (6)	○	○	○	○	○
Mobile app (7)	○	○	○	○	○
Text reminders (8)	○	○	○	○	○
Other (Please specify): (9)	○	○	○	○	○

Page Break

Q84

Please rate your level of agreement with the following statement:
Nothing would sway me to get the HPV vaccine, I do not need this vaccine.

- ○ Strongly disagree (1)
- ○ Somewhat disagree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat agree (4)
- ○ Strongly agree (5)

Page Break

Q86 When thinking about the HPV vaccine, how much do you trust the information that comes from:

	None at all (1)	A little (2)	A moderate amount (3)	A lot (4)	A great deal (5)
A doctor (1)	○	○	○	○	○

A pharmacist (2)	○	○	○	○	○
A physicians assistant (PA) (3)	○	○	○	○	○
A nurse practitioner (4)	○	○	○	○	○
A nurse (5)	○	○	○	○	○
A dentist (6)	○	○	○	○	○
A dental hygienist (7)	○	○	○	○	○
A family member (8)	○	○	○	○	○
A close friend (9)	○	○	○	○	○
A sexual partner (10)	○	○	○	○	○
The US government (11)	○	○	○	○	○
The US Food and Drug Administration (FDA) (12)	○	○	○	○	○
The Centers for Disease Control and Prevention (CDC) (13)	○	○	○	○	○
The World Health Organization (WHO) (14)	○	○	○	○	○
A Pharmaceutical drug company (15)	○	○	○	○	○

Page Break
End of Block: Messaging Strategies
Start of Block: Intro to messaging strategies
Q106 Below are some hypothetical messaging strategies about HPV and the HPV vaccine that could be used to encourage people to get the vaccine. Please read each message and rate how likely the message would encourage you to get the HPV vaccine.
End of Block: Intro to messaging strategies
Start of Block: Randomized Message Strategy #1
Q91 Please rate how likely the following message would encourage you to get the HPV vaccine.

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)
HPV is a common virus. It's estimated that more than 85% of all sexually active adults become infected with HPV in their lifetime. For most people, HPV clears on its own. But for others that don't clear the virus, HPV could lead to certain cancers in both men and women. There is no way to know which patients who have HPV	○	○	○	○	○

will develop cancer. (1)	

Q113 When thinking about the message you just read, please rate your agreement with the statements below:

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
I trust this message (1)	○	○	○	○	○
I think this message is effective (2)	○	○	○	○	○
I like this message (3)	○	○	○	○	○

End of Block: Randomized Message Strategy #1
Start of Block: Randomized Message Strategy #2
Q92 Please rate how likely the following message would encourage you to get the HPV vaccine.

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)
The HPV vaccine can help you protect yourself and others from HPV-related cancers. It has minimal side effects and could prevent more than 90% of HPV-related cancers. The HPV vaccine is recommended for both men and women	○	○	○	○	○

through age 26. If you haven't yet received the vaccine, it's not too late! Get the HPV vaccine today. (1)	

Q114 When thinking about the message you just read, please rate your agreement with the statements below:

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
I trust this message (1)	○	○	○	○	○
I think this message is effective (2)	○	○	○	○	○
I like this message (3)	○	○	○	○	○

End of Block: Randomized Message Strategy #2
Start of Block: Randomized Message Strategy #3

Q93 Please rate how likely the following message would encourage you to get the HPV vaccine.

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)
HPV can cause genital warts, which can make you feel ugly and unattractive and adversely affect your social life. Get the HPV vaccine today to	○	○	○	○	○

protect yourself and others from HPV. (1)	

Q115 When thinking about the message you just read, please rate your agreement with the statements below:

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
I trust this message (1)	○	○	○	○	○
I think this message is effective (2)	○	○	○	○	○
I like this message (3)	○	○	○	○	○

End of Block: Randomized Message Strategy #3
Start of Block: Randomized Message Strategy #4
Q94 Please rate how likely the following message would encourage you to get the HPV vaccine.

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)
HPV can cause genital warts, which can cause discomfort and itching and can adversely affect your health. Get the HPV vaccine today to protect yourself and others from HPV. (1)	○	○	○	○	○

Q116 When thinking about the message you just read, please rate your agreement with the statements below:

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
I trust this message (1)	○	○	○	○	○
I think this message is effective (2)	○	○	○	○	○
I like this message (3)	○	○	○	○	○

End of Block: Randomized Message Strategy #4
Start of Block: Randomized Message Strategy #5
Q95 Please rate how likely the following message would encourage you to get the HPV vaccine.

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)
HPV can cause cancer, which can make you feel isolated and depressed and can adversely affect your social life. Get the HPV vaccine today to protect yourself and others from HPV. (1)	○	○	○	○	○

Q117 When thinking about the message you just read, please rate your agreement with the statements below:

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor	Somewhat agree (4)	Strongly agree (5)

	disagree (3)				
I trust this message (1)	○	○	○	○	○
I think this message is effective (2)	○	○	○	○	○
I like this message (3)	○	○	○	○	○

End of Block: Randomized Message Strategy #5
Start of Block: Randomized Message Strategy #6

Q96 Please rate how likely the following message would encourage you to get the HPV vaccine.

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)
HPV can cause cancer, damaging your cells and weakening your immune system, and can adversely affect your health. Get the HPV vaccine today to protect yourself and others from HPV. (1)	○	○	○	○	○

Q118 When thinking about the message you just read, please rate your agreement with the statements below:

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)

I trust this message (1)	○	○	○	○	○
I think this message is effective (2)	○	○	○	○	○
I like this message (3)	○	○	○	○	○

End of Block: Randomized Message Strategy #6
Start of Block: Randomized Message Strategy #7
Q97 Please rate how likely the following message would encourage you to get the HPV vaccine.

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)
HPV can cause cancer, often requiring chemotherapy, radiation, or surgery, and costing you thousands of dollars. Get the HPV vaccine today to protect yourself and others from HPV. (1)	○	○	○	○	○

Q119 When thinking about the message you just read, please rate your agreement with the statements below:

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
I trust this message (1)	○	○	○	○	○
I think this message is effective (2)	○	○	○	○	○
I like this	○	○	○	○	○

message (3)	

End of Block: Randomized Message Strategy #7
Start of Block: Randomized Message Strategy #8
Q98 Please rate how likely the following message would encourage you to get the HPV vaccine.

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)
‘I had no idea that HPV could cause cancer in both men and women. I got an HPV-related cancer and almost died. I didn’t even know that I could have gotten the vaccine and protected myself.” Don’t let this story be your story. Get the vaccine today to protect yourself and others from HPV. (1)	○	○	○	○	○

Q120 When thinking about the message you just read, please rate your agreement with the statements below:

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
I trust this message (1)	○	○	○	○	○

I think this message is effective (2)	○	○	○	○	○
I like this message (3)	○	○	○	○	○

End of Block: Randomized Message Strategy #8
Start of Block: Randomized Message Strategy #9

Q99 Please rate how likely the following message would encourage you to get the HPV vaccine.

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)
HPV can cause cancer in both men and women. If you don't get the HPV vaccine, you are at risk for getting HPV, which can lead to cancer, and ultimately, death. Get the HPV vaccine today to protect yourself and others from HPV. (1)	○	○	○	○	○

Q121 When thinking about the message you just read, please rate your agreement with the statements below:

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
I trust this message (1)	○	○	○	○	○
I think this	○	○	○	○	○

message is effective (2)					
I like this message (3)	○	○	○	○	○

End of Block: Randomized Message Strategy #9
Start of Block: Randomized Message Strategy #10
Q100 Please rate how likely the following message would encourage you to get the HPV vaccine.

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)
The HPV vaccine protects both men and women from developing HPV-related cancers later in life. Imagine how you would feel if you got an HPV-related cancer and realized that you could have prevented it? Get the HPV vaccine today to protect yourself and others from HPV. (1)	○	○	○	○	○

Q122 When thinking about the message you just read, please rate your agreement with the statements below:

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)

I trust this message (1)	○	○	○	○	○
I think this message is effective (2)	○	○	○	○	○
I like this message (3)	○	○	○	○	○

End of Block: Randomized Message Strategy #10
Start of Block: Open ended message preferences

Q103 What messaging strategies would you like to see within the HPV vaccine space?
_____
_____
_____
_____
_____

End of Block: Open ended message preferences
Start of Block: Regulatory: Prevention vs Promotion Focused
Q83 The next set of questions relates to specific events in your life and how you feel.
Q56 This set of questions asks you about specific events in your life. Please indicate your answer to each question by selecting the appropriate number.

	1 -- Never or Seldom (1)	2 (2)	3 -- Sometimes (3)	4 (4)	5 -- Very Often (5)
Compared to most people, are you typically unable to get what you want out of life? (1)	○	○	○	○	○
Growing up, would you ever "cross the line" by doing things that your parents would not tolerate? (2)	○	○	○	○	○
How often	○	○	○	○	○

have you accomplished things that got you "psyched" to work even harder? (3)					
How often did you obey rules and regulations that were established by your parents? (4)	○	○	○	○	○
Growing up, did you ever act in ways that your parents thought were objectionable? (5)	○	○	○	○	○
Do you often do well at different things that you try? (6)	○	○	○	○	○
Not being careful enough has gotten me into trouble at times. (7)	○	○	○	○	○

Page Break

Q58

This set of questions asks you about specific events in your life. Please indicate your answer to each question by selecting the appropriate number.

When it comes to achieving things that are important to me, I find that I don't perform as well as I ideally would like to.

○ 1 -- Never true (1)

○ 2 (2)

○ 3 -- Sometimes true (3)

○ 4 (4)

○ 5 -- Very often true (5)

Page Break

Q59 This set of questions asks you about specific events in your life. Please indicate your answer to each question by selecting the appropriate number.

	1 -- Certainly false (1)	2 (2)	3 (3)	4 (4)	5 -- Certainly true (5)
I feel like I have made progress towards being successful in my life. (1)	○	○	○	○	○
I have found few hobbies or activities in my life that capture my interest or motivate me to put effort into them. (2)	○	○	○	○	○

Page Break

End of Block: Regulatory: Prevention vs Promotion Focused

Start of Block: Relationship Status

Q78 The next set of questions relates to your sexual preferences and behavior.

Q15 What is your sexual orientation?

○ Heterosexual (Straight) (1)

○ Homosexual (Gay/Lesbian) (2)

○ Bisexual (3)

○ Asexual (4)

○ Other (Please specify): (5) _____

Q16
What is your relationship status?

- Single (1)
- Dating someone (2)
- Married (3)
- Divorced (4)

Q17 Are you sexually active?

- Yes (1)
- No (2)
- Not at the time, but have been in the past (3)

Page Break

Display This Question:
If Are you sexually active? = Yes
Q104 Which statement best describes your sexual activity over the past 3 months?

- I had sex with one partner over the past 3 months (1)
- I had sex with multiple partners over the past 3 months (2)

Page Break
Display This Question:
If Are you sexually active? = Yes
Or Are you sexually active? = Not at the time, but have been in the past
Q18 Do you use any kind of Sexually Transmitted Infection (STI) or Sexually Transmitted Disease (STD) protection such as condoms (do not include birth control methods)

- Always (1)
- Usually (2)
- Almost half the time (3)
- Seldom (4)
- Never (5)

End of Block: Relationship Status
Start of Block: Demographics
Q85 This last set of questions relates to demographics.
Q26
What best describes the area where you grew up?

- Urban (1)

- ○ Suburban (2)
- ○ Rural (3)
- ○ Not sure (4)

Q125 How would you describe yourself?

- ○ Man (1)
- ○ Woman (2)
- ○ Trans man (3)
- ○ Trans woman (4)
- ○ Non-binary (5)
- ○ Other (Please specify): (6) _____

Q28 What is your race?

- ○ White (1)
- ○ Black or African American (2)
- ○ American Indian or Alaska Native (3)
- ○ Asian (4)
- ○ Native Hawaiian or Pacific Islander (5)
- ○ Other (6)

Q29 Please indicate the highest level of education that you have completed.

- ○ Some high school (1)
- ○ High school diploma or GED (2)
- ○ Some college (3)
- ○ College degree (4)
- ○ Masters or other graduate degree (5)
- ○ Did not complete high school (6)

Q34 Do you actively practice a religion?

- ○ Yes (1)
- ○ No (2)

Q35
How important is religion in your life?

- Extremely important (1)
- Very important (2)
- Moderately important (3)
- Slightly important (4)
- Not at all important (5)

Q36 What best describes your political affiliation?

- Republican (1)
- Democrat (2)
- Independent (3)
- No preference (4)

End of Block: Demographics