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Use of HPV Vaccination for Cervical Cancer Prevention in African American Women

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Abstract

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MPH, Morehouse School of Medicine, 2015

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Doctoral Study Submitted in Partial Fulfillment

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Doctor of Public Health

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May 2018

Abstract

Despite the availability of the human papillomavirus (HPV) vaccine, African American women are still at risk for contracting HPV. This is significant because HPV is one of the main risk factors for cervical cancer. The purpose of this quantitative study was to explore the relationship between the use of HPV vaccination for cervical cancer prevention and personal history of HPV, reduced access to healthcare, and risky sexual behaviors in African American women. The theoretical framework used for this study was the health belief model (HBM). Two hundred twenty-nine (*n*=229) African American women living in the United States, ages 18-49, who participated in the 2013-2014 National Health and Nutrition Examination Survey (NHANES) were the sample under study. A univariate analysis was performed to describe the population and obtain frequencies and percentages for all covariates. A bivariate analysis was conducted to determine whether there was an association between any of the independent variables and the dependent variable. A multivariable logistic regression was conducted to build a predictor model for use of HPV vaccination. Women between the ages of 18 and 34 were 7.22 times as likely to receive the HPV vaccine as women aged 35-49 years, and this was statistically significant (*OR*: 7.22; 95% *CI*: 2.36 – 22.13). This study can contribute to positive social change within the community and public health profession through an increased awareness and knowledge of HPV and cervical cancer, especially for African American women.

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Dedication

Being black in this world certainly comes with its struggles, but I would not trade that integral part of my identity for anything! #BlackGirlMagic is real and has been since the beginning of time! It is however a sad element that we are often plagued with disproportionately high incidences and mortality rates for heart disease, breast and cervical cancer, sickle cell, fibroids, premature births, STIs/STDs, mental health issues and so much more. It sounds scary because we feel like we are always the target, but knowledge is power and for that...this work is dedicated to you! For our journeys in learning to educate ourselves, our communities, and being an advocate for our own health equity, health quality, and health disparities is one that will raise alarm and awareness. After all…

"All knowledge meets an end at the question...Why?" —Criss Jami, Healology

Too often we are seen as 'running but never catching up' and handed few choices and even fewer protections. But, we must remember that we are strong, worthy, resilient, and the greatest gift to mankind. Thus, our very existence and health is the upmost importance because if we don't take it seriously, who will? I hope this work inspires you and contributes to your insightfulness and exploration of health issues affecting us black women. After all…

"We do not know a truth without knowing its cause." —Aristotle, *Nicomacheian Ethics,* I.1.

I have spent my entire academic journey on trying to figure out how I as a public health practitioner and researcher can educate and improve health statuses and quality of life for black and minority women. A wise man once said we cannot be informed if the information is not better. So, here's to learning, educating, and changing headlines. After all…

"I have never felt more confident in myself, more clear on who I am as a woman…But I am constantly thinking about my own health." —Michelle Obama

Last but certainly not least, this humble work is dedicated to and is a sign of my love for all of the strong black men and women leaders and role models in my family, circle of networks, and other political, social, philanthropic, and health fields that have demonstrated conviction and shown me what it means to be truly authentic. A special heartfelt thank you to those family members, friends, and *Sorors* of Alpha Kappa Alpha Sorority, Incorporated who have seen my potential, called it out, and began addressing me as "Dr. Dee", "Dr. Hanson", "Dr. Diamond", or "Dr. Bestie" long before I was given this title. I love you all and I am forever grateful of the unconditional love, support, enthusiasm, and encouragement you all have given me! And to the leaders who are yet to come but are experiencing the moments that matter, I see you Kings and Queens…keep smiling, stay focused, and don't ever let anyone dim your light!

Acknowledgments

I feel entitled to write this section with the intent of being comprehensive rather than succinct. It is the best opportunity I have to express my gratitude in writing to all of the individuals who have helped me knowingly or unknowingly, directly or indirectly, throughout the last 2 years and 11 months. After an intensive period of public health learning and research and writing, the finishing touches have been embedded on this capstone. This research has impacted my personal life, growth and development, and will further shape my public health career and focus. I am privileged and honored to have had individuals that provided their expertise, invaluable time, love, and belief in the importance of this work, and, in me. To the most high who continues to surprise, compel, and challenge me, and, guide me and make everything possible, even when seeming impossible, I am forever grateful of your love.

Dr. Vasileios Margaritis, I simply cannot thank you enough for the opportunity to pursue this scholarly research endeavor under your supervision and leadership. Your intelligence, expertise, unwavering support, and thoroughness and timeliness have allowed me to reach the finish line of my academic journey at Walden University. Not only did you step-in and step-up when I needed the motivation and support to complete this program on an academic level, but you provided clear direction and balance which was extremely fundamental to completing this work. I thank you for your countless hours of reading and editing and being patient throughout this entire process. Your ability to oversee this project and respond to correspondence around the clock from Athens, Greece truly inspired me and will forever be appreciated. I still often wonder

how and if you ever slept. You continuously exhibited a positive attitude and conveyed a spirit of adventure in regards to research and academia. It is because of your steadfast direction and motivation that this project is being completed at this time, and for that I am forever grateful!

Dr. Lee Caplan, in 2013 you ignited my interest in cancer epidemiology which led to me to participate in the Morehouse School of Medicine Cancer Prevention and Control Program (MSM-CPCP) while completing the Master of Public Health Program. This interest fueled my fire in further exploring HPV and cervical cancer as part of my thesis and doctoral work, both of which you graciously agreed to guide me as a Committee Member. Your support, intelligence, insight and helpful critique offered by you on many occasions has helped me accomplish work that I am proud of and have been so fortunate enough to present twice within three years at the American Public Health Association Annual Meeting.

Ms. Mechelle Claridy, with you I have learned a myriad of ways to make a contribution to public health. You are #BlackGirlMagic at its finest: quick, witty, intelligent, and a go-getter. You have supported, encouraged, and instilled masses of confidence in me. Your sage advice and patience abetted the writing of this doctoral capstone and you have been the instrumental component in my participation in the American Public Health Annual Meeting on both occasions, the completion of my thesis during the Morehouse School of Medicine Master of Public Health Program, and now, during my Doctor of Public Health Program. You always found time to assist me with statistical analysis, keeping calm, and staying motivated at times I felt stagnant and even

when your own doctoral studies and personal life weighed on your shoulders. Your drive, leadership, and personality are more than admirable and are qualities anyone should emulate! Your steadfast support of this project, mentorship, and expertise has been invaluable to all aspects of my life, was greatly needed, deeply appreciated, and for that, I am forever indebted. I love you!

And throughout the entire journey, the unconditional love and encouragement of my family aided in completion of this work. I could not have been more blessed to have an ensemble of champions and cheerleaders standing beside me, cheering me on, and motivating me to excel; you all have been that and so much more. I am eternally grateful and forever indebted!

To my amazing parents: Willnette and Kevin Honey, who exposed me to all sorts of opportunities as I grew up and were incredibly encouraging of all I wanted to do, this is for you. The great examples the both of you showed me and the sacrifices the two of you made to ensure I had the best support system in place has taught me to work hard for things I aspire to achieve. While I could expound on the impact and love on my life for several more pages, I can just as easily summarize your meaning to me in a single sentence: a kid couldn't ask for better parents. I simply owe everything I have accomplished to you two! To my sister, Lette, the world is yours, go conquer it! To my loving grandparents: Diane Hanson, Yvonne Ortiz, and Willie Vinson, I have learned from you all the importance of education, opportunity, and the power of prayer. My successes have been a result of the wisdom you all instilled in me. I love each of you!

Rich (affectionately known as “babe”) Williams, you believed in me when I doubted myself and your love sustained me. Many times, I just needed some ‘tough love’ and a few seconds of insane motivation, and with you I received it daily. You taught me how to master time effectively and get things done. You always said to me, “if you spend too much time thinking about it you’ll never get it done” and “if you really want to accomplish something, just do it,” (like that place with the orange swoosh who gets all of our money). These words resonated every day, each time I picked up the computer to write a section of this capstone, all the times I felt physically and mentally drained, and every time I felt like the world was on my shoulders. Thank you for always loving me, believing in me, and pushing me to go further. Your practical and emotional support as I added the roles of being your woman and an entrepreneur all to the competing demands of striving to be an academic scholar, successful career woman, and an active AKA woman has been tremendous. I simply could not ask for a better man to be by my side, and in my life! I thank God for you and I love you!

To my best friend Sharone Witter, there are so many things I want to thank you for, but this is just a small token of my gratitude. Thank you for just being by my side. Thank you for the late night dinner runs, laughter, tissue for my tears, Tylenol for my headaches, and toasts to all my successes! I’ve never had to wonder who was in my opponent’s corner, because I knew I was always going to have you in mine, and with that, what more could a girl really ask for? Your incredible support pushed me to excel and accomplish everything I have ever dreamt of doing or becoming. You are literally always ‘down for the cause’ and down for whatever crazy/insane/genius-of-an-idea or

business concept I come up with. I simply cannot wait to constantly remind your husband that he got crazy lucky! I'm so blessed that God put you in my life (since Girl Scouts) because he knew I would literally be lost without you. Thank you for being *a girl's best friend*, I love you!

To the many extended family, friends, and sisterhoods whose individual names would go on for several more pages, while I cannot address you all individually please know that I do sincerely thank you all for your genuine encouragement, support, and advice that you all provided me individually or collectively. I love you all!

Last but not least, to the person who is reading this, thank you! I hope this research work brings as much knowledge and awareness to you as it did to me. By reading this, you are accompanying me on a journey of exploration that has been challenging and relatable, yet a prolific learning experience. This is only a beginning of my journey and any future success that I may enjoy will be built on the foundation laid by all of those aforementioned. The extent to which I feel indebted to you all is humbling and as I emerge from my formal education and look to start contributing to the world in earnest, I will never forget the large debt I owe to these benefactors and to society. I'm eager to start paying everyone back!

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Section 1: Foundation of the Study and Literature Review

Introduction

The human papillomavirus (HPV) is the most common sexually transmitted infection (STI) in the United States (Vázquez-Otero et al., 2016; Young et al., 2015). HPV is so common that the Centers for Disease Control and Prevention (CDC) stated that almost every sexually active person will become infected with HPV at some point in their lifetime (CDC, 2017a). There are two main types of HPV: low-risk (LR-HPV) and high-risk (HR-HPV). LR-HPV causes approximately 90% of genital warts and HR-HPV, especially HPV-16 and 18, causes more than 70% of cervical cancer cases (CDC, 2017a; Winer et al., 2006). Furthermore, the CDC estimated that each year, HPV will cause cancer in 17,000 women (CDC, 2017a). These statistics reveal a public health issue that is more alarming for certain racial/ethnic groups. Previous researchers have presented varying results which have found that African American women who were screened as much or at higher rates than Caucasian women still exhibited the highest cervical cancer mortality rate (King, Chen, Garza, & Thomas, 2014; Downs Jr., Scarinci, Einstein, Collins, & Flowers, 2010).

This study contributes to positive social change within the community and the public health profession. Individuals and communities will have an increased awareness and knowledge about HPV, cervical cancer, the relationship between the two, and the importance of receiving the HPV vaccine. As a result, the dissemination of this information by public health practitioners would aid in increased vaccination rates, decreased HPV infections, and decreased cervical cancer diagnoses and fatalities,

especially among African American women. This study is unique because it explores the relationships between the use of HPV vaccination and personal history of HPV, reduced access to healthcare, and sexual behaviors among African American women, ages 18–49, in the United States, whereas previous studies have explored this relationship in specific geographical locations.

In Section 1, I present the problem statement and purpose of the study. Following these subsections, I discuss the studies' research questions and hypotheses, as well as the theoretical foundation and nature of the study. Next, I present a detailed literature search strategy and an extensive literature review, including definitions (see Appendix A for more information on abbreviations), assumptions, scope, and delimitations. Lastly, I explore the significance of the study and potential contributions to the areas of policy and/or practice and a summary of the literature.

Problem Statement

HPV is the most commonly STI in the United States with approximately 79 million Americans currently infected, and 14 million new infections occurring each year (Vázquez-Otero et al., 2016; Young et al., 2015). Half of these infections occur among individuals between the ages of 15 and 24. Despite the availability of the HPV vaccine, African American women in the United States, ages 18–49, are still at risk for contracting HPV, which causes cancer.

To date, many studies have been conducted on HPV vaccinations and Pap smear screenings and the disparities that exist among African American women compared to other racial/ethnic groups. Although African American women are just as likely or more

than likely to have a Pap smear than Caucasian women, they are more likely to die from the disease than Caucasian women (Brown, Wilson, Boothe, & Harris, 2011). Studies suggest that African American women are less likely to be educated about the risk of HPV and its relationship to cervical cancer compared to women of other racial/ethnic groups due to personal history of HPV, reduced access to healthcare, and risky sexual behaviors, which can all influence HPV infections (Mullins et al., 2016; Vázquez-Otero et al., 2016; Strohl et al., 2015; Okafor, Hu, & Cook, 2015;Mayhew et al., 2014; Laz, Rahman, & Berenson, 2012; Wong & Do, 2012; Brown, Wilson, Boothe, & Harris, 2011; Dempsey, Cohn, Dalton, & Ruffin, 2011; Downs, Scarinci, Einstein, Collins & Flowers, 2010; Garner, 2003). More recently, new research has suggested that African American women are infected with strains of cervical cancer-causing HPV subtypes (i.e. 31, 35, 45, 56, 58, 66 and 68) that the current vaccines do not protect against, which may significantly contribute to higher cervical cancer morbidity and mortality rates (Vidal et al., 2014).

Purpose of the Study

The purpose of this quantitative study was to explore the relationship between the use of HPV vaccination and personal history of HPV, reduced access to healthcare, and risky sexual behaviors among African American women, ages 18–49, in the United States. The identified independent variables were personal history of HPV, reduced access to healthcare, and sexual behavior. The dependent variable was the use of HPV vaccination. Covariates included in this study were age, marital status, annual household

income, educational attainment, and specific risky sexual behaviors. For the purposes of this study, 'use' and 'receipt' of HPV were used interchangeably.

Research Questions and Hypotheses

The following were the research questions and associated hypotheses for this study:

Research Question 1 (RQ1): Is there an association between use of HPV vaccination and personal history of HPV among African American women, ages 18–49?

Null Hypothesis ($H_0$1): There is no association between use of HPV vaccination and personal history of HPV among African American women, ages 18–49.

Alternative Hypothesis (H_a1): There is an association between use of HPV vaccination and personal history of HPV among African American women, ages 18–49.

- Dependent Variable: Use of HPV vaccination for cervical cancer prevention
- Independent Variable: Personal history of HPV

Research Question 2 (RQ2): Is there an association between use of HPV vaccination and reduced access to healthcare among African American women, ages 18–49?

Null Hypothesis ($H_0$2): There is no association between use of HPV vaccination and reduced access to healthcare among African American women, ages 18–49.

Alternative Hypothesis (H_a2): There is an association between use of HPV vaccination and reduced access to healthcare among African American women, ages 18–49.

- Dependent Variable: Use of HPV vaccination for cervical cancer prevention
- Independent Variable: Reduced access to healthcare

Research Question 3 (RQ3): Is there an association between use of HPV vaccination and risky sexual behaviors among African American women, ages 18–49?

Null Hypothesis ($H_0$3): There is no association between use of HPV vaccination and risky sexual behaviors among African American women, ages 18–49.

Alternative Hypothesis (H_a3): There is an association between use of HPV vaccination and risky sexual behaviors among African American women, ages 18–49.

- Dependent Variable: Use of HPV vaccination for cervical cancer prevention
- Independent Variable: Risky sexual behaviors

Theoretical Foundation for the Study

The theoretical framework for this study was based on the health belief model (HBM), which is shown in Figures 1 (health belief model components) and 2 (health belief model for HPV vaccination). Developed in the 1950s by social psychologists, Hochbaum, Rosenstock, and Kegels, who worked for the United States Public Health Services, the HBM is a psychological model that attempts to describe and predict health behaviors (Glanz, Rimer, & Lewis, 2002; Rosenstock, 1974). By focusing on the attitudes and beliefs of individuals, the HBM was developed in response to the failure of a free tuberculosis health screening program. Since its inception, the HBM has been adapted to explore various long and short-term health behaviors, and most notably, risky sexual behaviors and the transmission of HIV/AIDS and other STIs (Glanz, Rimer, & Lewis, 2002; Rosenstock, 1974). Per Conner and Norman (1996), the HBM has been applied to a broad range of health behaviors such as “preventive health behaviors, which

include health-promoting (e.g. diet, exercise) and health-risk (e.g. smoking) behaviors as well as vaccination and contraceptive practices."

To date, the HBM has been used by a plethora of studies surrounding HPV and cervical cancer, the factors and beliefs that contribute to HPV infection, and the issues surrounding cervical cancer prevention (i.e. HPV vaccine, Pap smear screening and follow-up) (Brown, Wilson, Boothe & Harris, 2011; Bynum et al., 2011; Hsu et al., 2009; Rosenthal et al., 2010). Research has suggested that health beliefs can influence whether an individual will accept and undergo HPV vaccination (Bynum et al., 2011; Rosenthal et al., 2010; Hsu et al., 2009). Furthermore, Rosenstock (1974) believed that participation in preventive health behaviors depends on an individual's perceived susceptibility to disease (HPV), severity of health outcomes (cervical cancer morbidity and/or mortality), benefits of and barriers (personal history and reduced access to healthcare) to behavior engagement, and cues to motivate action (conversations with healthcare providers, an increased knowledge about HPV and cervical cancer, and vaccination for cervical cancer prevention). The HBM provides a useful framework for creating prevention and intervention programs, which would help improve HPV and cervical cancer knowledge, and vaccination initiation and completion rates among African American women (Brown, Wilson, Boothe & Harris, 2011). For the purposes of this study, the core assumption is that an individual will take a health-related action (i.e. utilize condoms, participate in HPV vaccinations, and become more knowledgeable about HPV and cervical cancer) if that individual:

1. Feels that a negative health condition/disease/infection, such as HPV, can be avoided.
2. Has a positive expectation that by taking a recommended action, she will avoid a negative health condition (i.e. utilizing safe sex practices to avoid HPV infection, and receiving the HPV vaccination to protect against cervical cancer),
3. Believes she can successfully take a recommended health action (i.e. utilizing safe sex practices comfortably, speaking openly with healthcare providers and parents with children, etc.)

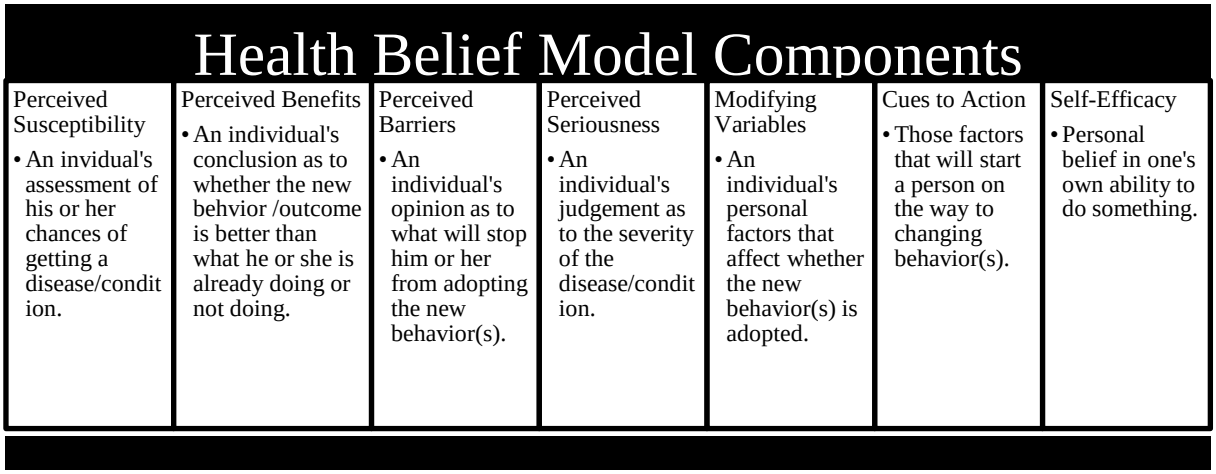

Figure 1. Health belief model components.

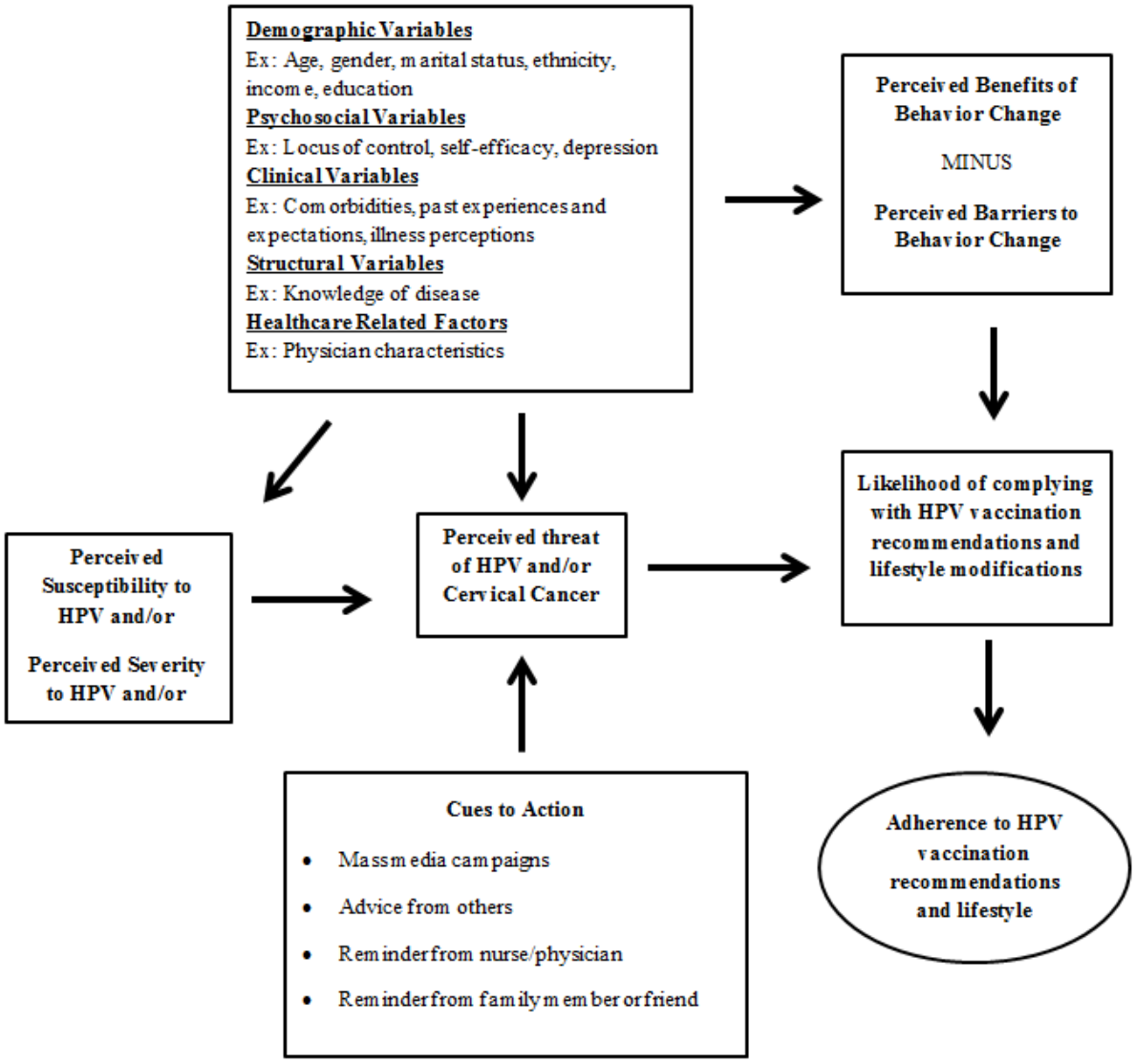

Figure 2. Health belief model for HPV vaccination for cervical cancer prevention. Adapted from" Factors influencing medication adherence and hypertension management revisited: recent insights from cancer survivors," by M. Morgado and S. Rolo, 2012, *Hypertension Research, 35(9),* p. 894-896.

Nature of the Study

The nature of this study was a quantitative, cross-sectional study design. This allows an observation of data collected at a specific point in time (2013–2014) in order to assess the prevalence of HPV vaccination use. The identified independent variables were personal history of HPV, reduced access to healthcare, and risky sexual behaviors. The dependent variable was use of HPV vaccination for cervical cancer prevention. Age, marital status, annual household income, educational attainment, and specific risky sexual behaviors were the identified covariates.

Secondary analysis of the National Health and Nutrition Examination Survey (NHANES) archived data were utilized for this study. NHANES is a recurring, population-based survey that was designed to assess the health and nutritional status of adults and children in the United States (CDC, 2017c). The NHANES interview includes information on demographics, socioeconomic factors, dietary behaviors, and health-related questions. I used demographic, laboratory, and health-related questionnaire data files from 2013–2014, as these years provided the most recent data for the variables. The study population was African American women between the ages of 18 and 49. I performed a univariate analysis to describe the population and obtain frequencies and percentages for all study variables. I also conducted a bivariate analysis to determine whether there was an association between any of the independent variables and the dependent variable. As a result of the bivariate analysis, the independent variables to be included in the multivariable logistic regression, which is conducted to build a predictor

model for use of HPV vaccination, were identified. Adjusted odds ratio (OR) and 95% CIs were generated and significant *p*-values were reported as $p < .05$.

Literature Search Strategy

The following literature review includes my summary of the prevailing research on the use of HPV vaccination and personal history of HPV, reduced access to healthcare, and risky sexual behaviors of African American women in the United States, ages 18–49. Relevant literature was obtained by using multiple search engines and databases, including Google Scholar, PubMed, Google Scholar, MedlinePlus, and the Walden University Library system. Additional data and information were collected online from the CDC and the American Cancer Society (ACS).

The key terms and combinations of search terms I used for the literature review included the following: *HPV and African American women, cervical cancer and African American women, HPV vaccination knowledge/attitudes/beliefs among African American women, HPV vaccination, black women and HPV, black women and cervical cancer, HPV vaccine and healthcare providers/physicians, HPV vaccine uptake among African American women, HPV racial/ethnic disparities, barriers to HPV vaccination,* and *HPV and risky sexual behaviors among African American women*. I ensured the most current literature was used by limiting the search to the years 2010 to 2016.

Literature Review Related to Key Variables and/or Concepts

Personal History of HPV

Use of HPV vaccination and overall knowledge and education about HPV, cervical cancer, and the relationship between the two can heavily influence the risk of HPV infection, which can then lead to cervical cancer incidence and/or mortality. Racial/ethnic disparities are prevalent with respect to cervical cancer screening, incidence, and mortality. For instance, rates of cervical cancer incidence per 100,000 people for African American women is 9.8 per compared to 7.0 for Caucasian women, 9.9 for Hispanic women, 9.7 for American Indian and Alaska native women, and, 6.1 for Asian and Pacific Islander women (ACS, 2017a). Cervical cancer mortality rates per 100,000 people for African American women is 3.9 compared to 2.1 for Caucasian women, 2.6 for Hispanic women, 2.8 for American Indian and Alaska native, and 1.7 for Asian and Pacific Islander women (ACS, 2017a). Downs Jr., Scarinci, Einstein, Collins, and Flowers (2010) found that although African American women were screened at higher rates (88% received at least one Pap smear between 2003 and 2006) than Caucasian women, they still exhibited the highest cervical cancer mortality rate (4.7/100,000) and the second highest incidence rate (10.8/100,000) (Downs Jr., Scarinci, Einstein, Collins, & Flowers, 2010). The authors suggested that this may be due to poor adherence to post-screening follow-up recommendations and dissimilar management of abnormal cytology, cervical dysplasia, and cervical cancer in African American women despite this group being more likely to complete timely screenings than Caucasian women (King, Chen, Garza, & Thomas, 2014).

In 2015, Strohl et al. sought to study the knowledge of HPV, cervical cancer, and HPV vaccination in African American women living in urban Chicago. Using a quantitative cross-sectional design, 322 surveys were distributed to African American women ages 18-70. These surveys assessed knowledge of HPV, cervical cancer, and the HPV vaccine. Two hundred and forty-two surveys were collected and 215 of the subjects met inclusion criteria. The average knowledge score was 12.3 ± 4.2 (mean ± SD) out of a maximum score of 28 (range, 3–23) in which 73% of participants scored <65% on the knowledge section of the survey, while educational level (*P*= .007), household income (*P*=.010) and having a child who had been offered the HPV vaccine (*P*=.041) were associated with adequate (65% accuracy) knowledge scores (Strohl et al., 2015). The authors concluded that knowledge of HPV, cervical cancer, and HPV vaccination was low in this urban African American adult female population and that specific educational health programs are needed to increase awareness among this population. Furthermore, findings from this study were consistent with previous results in similar studies that found that African American women were more likely to have less knowledge of HPV, cervical cancer, and HPV vaccination. This study, however, was limited as it recruited urban women through convenience sampling. Because this sample was not random, it might not have been representative of all African American women.

Okafor, Hu, and Cook (2015) sought to determine whether there is a relationship between racial/ethnic status and the initiation and completion of the HPV vaccine in college women between the ages of 18 and 26 years of age recruited from a large college. The women completed surveys that gathered information on sociodemographic

characteristics, risky sexual behaviors, gynecological healthcare use, and perception of risk of acquiring HPV-associated diseases" (Okafor, Hu, & Cook, 2015). A total of 53% of the women indicated that they had at least one of the three doses of HPV vaccine, and among them 70% stated they had completed the full vaccination series of three doses (Okafor, Hu, & Cook, 2015). Black women were significantly less likely to report both initiation and completion of the vaccine series than women of other racial/ethnic groups (Okafor, Hu, & Cook, 2015). This study was one of the few that investigated racial/ethnic differences in HPV vaccine uptake in college women, and it provided a 5-year update on rates of initiation and completion of the HPV vaccine series (Okafor, Hu, & Cook, 2015). However, this study was limited as the primary outcome was self-reported, which has potential for reporting bias in the estimates of HPV vaccine uptake (Okafor, Hu, & Cook, 2015). In addition, other factors, such as socioeconomic status and cultural health beliefs, which could have influenced the propensity to become vaccinated, were not considered.

Laz, Rahman and Berenson (2012) conducted a study to provide an update on HPV vaccine initiation among women between the ages of 18 and 26. Data from the National Health Interview Survey were used to estimate HPV vaccine coverage and HPV vaccine awareness, receipt of the vaccine, number of doses, perceived barriers, and relevant socio-demographic variables. The survey focused on questions related to HPV vaccine awareness, receipt of the vaccine, number of doses received, perceived barriers, and relevant sociodemographic variables. The results showed that 77.3% of women ages 18-26 were not vaccinated. Out of those women, 68.6% were either not interested in

receiving the vaccine or were unsure about receiving the vaccine due to the following reasons: felt the vaccine was not needed (39.6%), insufficient knowledge about the vaccine (12.7%), concerns about the safety of the vaccine (12.0%), vaccine was not recommended by the physician (7.2%), was not sexually active (6.7%), and thought she was too old for the vaccine (3.1%) (Laz, Rahman & Berenson, 2012). Racial/ethnic disparities were present as black women were less likely to complete the series of three doses of HPV vaccine than Caucasian women (Laz, Rahman & Berenson, 2012). Furthermore, women who were uninsured were less likely to receive ≥1 dose (Laz, Rahman & Berenson, 2012). The study had some limitations. First, the data questionnaires were self-reported and may be subject to recall bias due to participants giving desirable instead of truthful answers, personal feelings during the time, embarrassment, and, questions being misread or misinterpreted. Next, information on vaccine receipt and number of doses received was not confirmed by provider immunization records, so there could have been some misclassification (Laz, Rahman & Berenson, 2012). Also, this study did not assess risky sexual behaviors, making it impossible to examine the association between risky sexual behaviors and receipt of vaccine (Laz, Rahman & Berenson, 2012). In all, this study contributed to a better understanding of racial/ethnic disparities, particularly among African American women, as well as additional barriers to initiation and/or completion of the HPV vaccination series.

Reduced Access to Healthcare

Studies have shown that barriers to HPV vaccination include low socioeconomic status as measured by income, low educational attainment, lack of insurance, and lack of communication between healthcare providers and patients (Strohl et al., 2015; Wong & Do, 2012; Dempsey, Cohn, Dalton, & Ruffin, 2011;Downs, Scarinci, Einstein, Collins & Flowers, 2010; Garner, 2003).

Wong and Do (2012) used the 2007 Health Information National Trends Survey (HINTS) to examine predictors of physician/patient discussion regarding the HPV vaccine in women 18 and older. The survey asked the following question: "Has a healthcare provider such as a doctor or nurse ever talked to you about a cervical cancer vaccine or HPV shot?" Only women who reported ever having heard of the cervical cancer vaccine or HPV shot before participating in the survey were asked this question (Wong & Do, 2012). African American women were the highest percentage (26.6%) of individuals who had HPV vaccine discussions wither their healthcare providers, compared to Hispanic women (17.2%) and Caucasian women (15.8%) (Wong & Do, 2012). However, Caucasian women were the most likely (88.7%) to be aware of the HPV vaccine, compared to African American women (73.2%) and Hispanic women (58.8%) (Wong & Do, 2012). Furthermore, a statistically significant association was observed between lower income and education levels and a lower likelihood of HPV vaccine awareness (Wong & Do, 2012). However, low levels of income and education did not affect the likelihood of having discussions about the HPV vaccine with healthcare providers (Wong & Do, 2012). A major limitation of this study was the short time

interval between the FDA approval of the quadrivalent vaccine in 2006 and the launch of the study in early 2008 (Wong & Do, 2012). Thus, the small number of respondents who reported having the HPV vaccine discussions with their healthcare providers may not be reflective of the corresponding situation today (Wong & Do, 2012).

Brown, Wilson, Boothe, and Harris (2011) studied the knowledge, attitudes, beliefs, and practices of ethnically diverse black women in regard to cervical cancer screening. Haitian, African, English-speaking Caribbean, and African American women were recruited from a federally qualified health center. Focus groups were conducted to discuss knowledge of and preventive measures against cervical cancer and HPV, facilitators of cervical cancer screening, and barriers to cervical cancer screening (Brown, Wilson, Boothe, & Harris, 2011). Reduced access to healthcare was discussed as it relates specifically to the barriers to cervical cancer screening among these groups of women. First, in studies of cervical cancer screening among black women, frequent change of residence which would necessitate a change in healthcare provider and lack of regular source of care, inability to take time off of work, lack of trust towards physicians, high cost of screening and treatment, family financial obligations, transportation costs, language, and citizenship status were major barriers to cervical cancer screening (Bigby, Ko, Johnson, David, & Ferrer, 2003; Brown, Wilson, Boothe, & Harris, 2011; Gany, Herrera, Avallone, & Changrani, 2006; Ponce et al., 2006; Tsui, Saraiya, Thompson, Dey, & Richardson, 2007). A major limitation of this study was the limited generalizability due to the small sample of 44 primarily low-income black women. Due

to this small sample, authors suggested that there is a great need to further explore the health-seeking behaviors of this population.

Dempsey, Cohn, Dalton, and Ruffin (2011) evaluated characteristics associated with HPV vaccine uptake among women between the ages of 19 and 26 seen in primary care, university- based clinics. As an extension from a previous study, clinical visit data (medical records and billing data) from the University of Michigan Health System were utilized to retrospectively assess various factors associated with HPV vaccine use (Dempsey, Cohn, Dalton, & Ruffin, 2011). Although there were 11,545 women, only 18% had initiated the three dose vaccine series (Dempsey, Cohn, Dalton, & Ruffin, 2011). There was reduced series initiation among older aged women, women who were publicly insured and Caucasian women (Dempsey, Cohn, Dalton, & Ruffin, 2011). On the other hand, there was a decrease in series completion among those who were publicly insured and African American (Dempsey, Cohn, Dalton, & Ruffin, 2011). Furthermore, results showed disparities by race and insurance worsened over time, which suggested that high risk populations were not getting vaccinated (Dempsey, Cohn, Dalton, & Ruffin, 2011). While the population studied was both economically and racially diverse, results are based on only one university-based health system located in the State of Michigan and may therefore not be generalizable to larger geographic locales (Dempsey, Cohn, Dalton, & Ruffin, 2011). In addition, this sample included a very small number of individuals without health insurance. Young adults have higher rates of being uninsured compared to other ages, and as a result, high out-of-pocket costs of HPV vaccines would possibly prevent many of these uninsured individuals from being vaccinated (Adams,

Newacheck, Park, Brindis, & Irwin, 2007; Dempsey, Cohn, Dalton, & Ruffin, 2011; Park, Paul Mulye, Adams, Brindis, & Irwin, 2006).

Downs Jr., Scarinci, Einstein, Collins, & Flowers (2010) studied populations of women in the United States at high risk for cervical cancer and assessed known reasons for the current outcome disparities (i.e. perceptions, attitudes, knowledge). The authors also explained ways in which the barriers for HPV vaccination could be reduced and strategies for cervical cancer prevention by way of vaccine acceptance and initiation could be improved. The methods for this study were developed by an expert forum conducted in 2008 by the Society of Gynecologic Oncologists. Epidemiological data were prepared and discussed by 56 experts in cervical cancer. One of the main barriers discussed was reduced access to healthcare for which five dimensions were described by Penchansky and Thomas (1981), including availability (volume and type of services vs. location of clientele); accommodation (the ease of obtaining appointments); affordability (cost and perceived ability to pay for care); and acceptability (perceptions about practice characteristics). When examining socioeconomic status and race among African American and Caucasian women, the authors found that family income was the strongest predictor of total healthcare access (Downs Jr., Scarinci, Einstein, Collins, & Flowers, 2010). There was also a significant interaction between occupation and race for total healthcare access. This meant that an individual's occupation significantly predicted accessibility, median income by zip code predicted accommodation, and family income significantly predicted affordability (Downs Jr., Scarinci, Einstein, Collins, & Flowers, 2010). Furthermore, it was noted that impoverished women access healthcare less

frequently than mainstream populations. Therefore, women are utilizing urgent or emergent care only, which limits their participation in preventive care such as cervical cancer screening (Downs Jr., Scarinci, Einstein, Collins, & Flowers, 2010; Sambamoorthi & McAlpine, 2003). Further discussion and implementation initiatives that focus on HPV awareness, knowledge, and vaccination will help eliminate disparities in cervical cancer incidence and mortality.

Risky sexual behaviors

Rates of STIs continue to increase among African American youth (Raiford, Seth, & DiClemente, 2013). Genital HPV is one of the most common STIs in the United States and has the highest rate of infection among college-aged women between the ages of 20 and 24 (Bynum et al., 2011). High risk sexual behaviors, including engaging in anal, oral, and/or vaginal sex without the use of a condom, multiple sex partners, early age at first coitus, and high number of lifetime sexual partners, may contribute to an increase in HPV transmission in African American women (Downs Jr., Scarinci, Einstein, Collins, & Flowers, 2010; Raiford, Seth, & DiClemente, 2013). Alcohol and drug use, which can lead to the engagement in risky sexual behaviors, has also been studied as a risk factor for HPV (Bennett et al., 2009; Bynum et al., 2011). In addition, the issue of whether receiving the HPV vaccine could lead to altered risk perceptions, resulting in the engagement of risky sexual behaviors, has also been studied (Mayhew et al., 2014; Mullins et al., 2016; Vázquez-Otero et al., 2016).

Vázquez-Otero et al. (2016) examined whether HPV vaccination was associated with inconsistent condom use among college students between the ages of 18 and 26,

using the National College Health Assessment-II dataset from fall 2013. HPV vaccination was the primary predictor variable while risky sexual activity was the outcome variable (Vázquez-Otero et al., 2016). There was no association between HPV vaccination and inconsistent condom use in any sexual activities, including vaginal, anal, or oral sex (Vázquez-Otero et al., 2016). These findings were consistent with previous studies, which also found no differences in the number of sex partners and frequency of condom use between individuals who were vaccinated and those who were not (Ratanasiripong, 2014). Additionally, a study by Mayhew et al. (2014) found that there were no changes observed in the initiation of sexual activity, number of sexual partners, or condom use six months after receiving the HPV vaccine. One limitation of the study by Vázquez-Otero et al. was that the data were self-reported which might have introduced social-desirability (participants giving responses based on what they think the researcher wants to hear) and non-differential misclassification biases (misinterpretation and/or false answers).

In a similar study, Mullins et al. (2016) sought to examine the association between risk perceptions after receiving the HPV vaccine and risky sexual behaviors and STI diagnosis over 30 months following vaccination. Sexually experienced women between the ages of 13 and 21 who had completed ≥2 of 4 follow-up visits at 2, 6, 18, 30 months and including 30 months were enrolled at the time of their first HPV vaccination (Mullins et al., 2016). During each visit, participants were asked about their perceived need for safer sexual behaviors and their perceived risk of STIs, other than HPV, as well as their risky sexual behaviors (Mullins et al., 2016). During each visit participants

completed surveys that assessed risk perceptions ("perceived need for safer sexual behaviors, perceived risk of STIs other than HPV") and risky sexual behaviors (Mullins et al., 2016). Condom use at last intercourse with main male partner, number of sexual partners since last study visit, and STI diagnosis were outcomes. Scale scores indicated that while perceived need for safer sexual behaviors did not change significantly over time, scale scores for perceived risk of STIs other than HPV decreased over time ($p=0.027$) (Mullins et al., 2016). Thus, after 30 months following the HPV vaccination, girls perceived themselves to be more at risk of STIs other than HPV than previously (Mullins et al., 2016). A multivariate model demonstrated that while the greater perceived need for safer sexual behaviors following vaccination was associated with condom use, it was not associated with the number of sexual partners or STI diagnosis (Mullins et al., 2016). In addition, perceived risk of STIs other than HPV was not associated with the three variables (Mullins et al., 2016). However, because there was no available information about risk perceptions for participants prior to their receipt of the first HPV vaccine dose, changes between pre-and post-vaccination risk perceptions could not be examined (Mullin et al., 2016). The findings of this study suggested that the HPV vaccination visit is a vital opportunity for health professionals to reiterate the importance of safer sexual behaviors to those who are sexually active, and further, to those who are not yet sexually active (Mullins et al., 2016).

Mayhew et al. (2014) assessed whether adolescent risk perceptions after the first vaccine dose predicted subsequent risky sexual behaviors. Questionnaires were completed after receiving the HPV vaccination and then two and six months later by girls

between the ages of 13 and 21. Participants were assessed based on their demographic characteristics, knowledge/attitudes about the HPV vaccine, risk perceptions, and risky sexual behaviors. For the 42.5% of girls who were sexually inexperienced, risk perceptions at baseline were not associated with subsequent sexual initiation (Mayhew et al., 2014). Girls 16 to 21 who reported lower perceived risk of STI were less likely to initiate sex (Mayhew, 2014). In addition, among all sexually active participants, baseline risk perceptions were not associated with subsequent number of sexual partners or condom use (Mayhew, 2014). Finally, risk perceptions after HPV vaccination were not associated with riskier sexual behaviors over the subsequent six months of the study (Mayhew, 2014). This study is significant in contributing to the growing evidence that receiving the HPV vaccine does not alter risky sexual behaviors among adolescents (Mayhew, 2014). This study was limited as it was conducted within a population comprised mainly of low-income black women, which could limit generalizability. The current study will look at African American women from all socioeconomic backgrounds.

Literature Summary

Literature focusing on personal history of HPV, reduced access to healthcare, and risky sexual behaviors, which can all impact the use of HPV vaccination among African American women, has been discussed. Okafor, Hu, and Cook (2015), Laz, Rahman and Berenson (2012), and Strohl et al., (2015) presented similar findings and concluded that knowledge about HPV and cervical cancer and HPV vaccine initiation and completion can influence the risk of HPV infection, which can lead to cervical cancer. The studies

conducted by Brown, Wilson, Boothe and Harris (2011), Dempsey, Cohn, Dalton and Ruffin (2011), Downs Jr., Scarinci, Einstein, Collins and Flowers (2010), and Wong & Do (2012) and explained that barriers to the utilization of the HPV vaccine include limited access to healthcare, low socioeconomic status, low educational attainment, and, lack of communication between providers and patients. Lastly, while engaging in risky sexual behaviors can lead to HPV infection, studies by Mayhew et al. (2014), Mullins et al. (2016), and Vázquez-Otero et al. (2016) concluded that a change in risky sexual behaviors was not associated with vaccine initiation.

Definitions

Cancer: With over 100 types, cancer is the leading cause of death worldwide and the second leading cause of death in the United States, causing approximately 8.2 million deaths in 2012 (National Cancer Institute [NCI], 2014a; Siegel, Ma, Zou & Jemal, 2014; Stewart & Wild, 2014). In 2017, the ACS predicts approximately 1.7 million new cancer cases and over 600,000 deaths (ACS, 2017a). The International Agency for Research on Cancer (IARC) predicted that by the year 2030 there will be 21.4 million new cancer cases and 13.2 million cancer deaths globally (ACS, 2015). Furthermore, in 2017, the ACS predicts 12,820 new cases of invasive cervical cancer, resulting in 4,210 deaths (ACS, 2017a).

Cervical cancer: Cervical cancer is the third most commonly diagnosed cancer in women worldwide (Arbyn et al., 2011; Ferlay et al., 2014). In 2012, there were an estimated 528,000 new cases and 266,000 deaths worldwide (Ferlay et al., 2014).

According to the National Institutes of Health (NIH), the United States ranks 14th in the world for cervical cancer cases (NIH, 2013). In 2013, there were nearly 250,000 American women living with cervical cancer (NCI, 2015).

At the opening of the uterus into the vagina is an organ referred to as the cervix. Cervical cancer is usually a slowly-developing disease that is initiated when cancerous cells form in tissues of the cervix (NCI, 2014b). While cervical cancer can form in any cervical cell, it primarily develops in those cells lining the surface of the cervix (NCI, 2014b), squamous and columnar cells (Chen, 2013). Squamous cell carcinomas account for 80 to 90 percent of cervical cancers. Adenocarcinomas develop from columnar cells and account for 10 to 12 percent of cervical cancers (Schuiling, & Likis, 2017). While there are multiple risk factors for cervical cancer, HPV is known to be a necessary cause (NCI, 2014b).

HPV: Derived from the papillomavirus family and consisting of over 200 strains, 40 of which are transmitted sexually, HPV infects human skin and moist membranes that line organs, including the throat, mouth, anus, and cervix (Sushma, Vamsikrishna, Babu & Mohanraj, 2014). Being infected with HPV can also lead to the development of head and neck squamous cell carcinoma (HNSCC) (Tan et al., 2015). HPV is primarily spread through skin-to-skin or mucosa-to-mucosa contact, including oral, vaginal, or anal sex (Burd, 2003; Schiffman, Castle, Rodriguez & Wachholder, 2007).

In the early 1980s, a German virologist named Harold zur Hausen was the first to discover an association between HPV infection and cervical cancer (Gomez & Santos, 2007; zur Hausen, 1994). Thereafter, HPV was recognized as a necessary cause of

cervical cancer, causing 99% of cases worldwide (Colombo et al., 2012; Gomez & Santos, 2007; Vu, Bui & Le, 2013).

Today, cervical cancer prevention is conducted using the Papanicolaou (Pap) smear. Created by George Nicholas Papanicolaou, who was credited with explaining the physiological and cytological features of the female reproductive system, the Pap smear is a method of obtaining cervical epithelial cells (Tan & Tatsumura, 2015). A pathologist then examines these cells to determine if precancerous or cancerous changes have occurred within the cervix (Tan & Tatsumura, 2015). Evidence has shown that 99% of cervical cancer deaths are preventable with the use of the Pap smear among regularly screened women (DeMay, 2000). Due to the strong association between HPV and cervical cancer, the ACS, the United States Preventive Services Task Force (USPSTF), and the American Society for Colposcopy and Cervical Pathology updated their recommendations for the early detection of precancerous lesions in the cervix to include screening for (HR)-HPV (Saslow et al., 2012). The revised screening recommendations (please see Appendices E and F for more information on USPSTF grades and suggestions for practice and cervical cancer screening recommendations) included the use of cytology and HR-HPV testing, follow-up (e.g., the management of screen positives and screening intervals for screen negatives) of women after screening, the age at which to discontinue screening, future considerations regarding HPV testing alone as a primary screening approach, and screening strategies for women vaccinated against HPV 16 and 18 infections (Saslow et al., 2012).

While cervical cancer is highly preventable through screening, researchers have observed racial/ethnic disparities that persist in cervical cancer screening and deaths. Per the National Center for Health Statistics (NCHS), except for two years, African American women have had the highest rates of Pap smear screenings from 1987-2010 (NCHS, 2013). In 2010, the Pap smear rate for African American women was almost 78%, followed by Hispanic women (73.6%), American Indian/Alaska Native women (73.4%), Caucasian women (72.8%), and finally Asian women (68.0%) (data for Native Hawaiian or other Pacific Islander were not reported), despite epidemiological data showing that African American women are more likely to have cervical cancer and die from it (NCHS, 2013; Brown, Wilson, Boothe, & Harris, 2011). On the other hand, the rate of HPV vaccination is low in the African American community, and this largely accounts for cervical cancer disparities (Strohl et al., 2015). Several studies have noted that little or no access to healthcare, lack of awareness and education about HPV and cervical cancer, and risky sexual behaviors also contribute to these disparities (Brown, Wilson, Boothe, & Harris, 2011; Downs, Scarinci, Einstein, Collins, & Flowers, 2010; Gelman et al., 2013; Scarinci, Litton, Garcés-Palacio, Partridge, & Castle, 2013; Strohl et al., 2015).

HPV vaccines. The burden of HPV-related diseases, recent scientific findings of viral etiology of several anogenital cancer types, and the development of prophylactic vaccines have presented an unprecedented opportunity for cervical cancer prevention on a global level (see Appendix D for more information on 2018 recommended immunizations). In addition to cervical cancer screening by use of the Pap smear, there are currently three Federal and Drug Administration (FDA) approved prophylactic HPV

vaccines: Gardasil (Human Papillomavirus Quadrivalent Vaccine Recombinant; Merck & Co., Inc.; approved in 2006), Gardasil 9 (Human Papillomavirus 9-valent Vaccine Recombinant; Merck & Co., Inc.; approved in 2014), and Cervarix (Human Papillomavirus Bivalent Vaccine, Recombinant; GlaxoSmithKline Biologicals; approved in 2009) (ACS, 2017b; FDA, 2017; National Cancer Institute [NCI], 2015; Saslow et al., 2007). Gardasil protects against HPV types 6, 11, 16, and 18 (FDA, 2017). Gardasil 9 protects against HPV types 6, 11, 16, 18, 31, 33, 45, 52, and 58 (FDA, 2017). Lastly, Cervarix protects against HPV types 16 and 18 (FDA, 2017). The goal of these prophylactic vaccinations is to reduce the incidence of HPV-related genital disease, including cervical, penile, vulvar, vaginal, and anal cancer, and precancerous lesions (Saslow et al., 2007).

Assumptions

An assumption identified is that because this study utilized a population-based dataset to obtain subjects, the external validity of the study is increased. Secondly, it is assumed that the current available vaccines may not adequately protect African American women from HPV and cervical cancer due to the strains of HPV found in African American women (Vidal et al., 2014).

Scope and Delimitations

A quantitative, cross-sectional study design was utilized for this study. NHANES data from 2013–2014, with the inclusion criteria limited to African American women between the ages of 18 and 49, were chosen as it contains the most up-to-date information reported on the variables to be studied. As of result of utilizing NHANES,

which is a database for secondary data analysis, there were no primary data collections or contact with the participants in the study. Variables utilized in this study were all included in NHANES. Therefore, no other databases were utilized. Since NHANES is a population-based database and only African American women were analyzed, results can be generalizable to larger African American populations. However, this study was limited to a quantitative, cross-sectional design and there were no control or comparison groups.

Significance of the Study and Potential for Positive Social Change

The purpose of this study was to determine the relationship between use of HPV vaccination and personal history of HPV, reduced access to healthcare, and risky sexual behaviors, controlling for age, marital status, annual household income, and educational attainment. This study is significant as it can provide an avenue to achieve the following behavioral and research outcomes:

- Increased awareness and education about HPV, cervical cancer, and the relationship between the two.
- Increased knowledge and awareness about the importance of receiving the HPV vaccination.
- Increased rates of HPV vaccinations for cervical cancer prevention.
- Exploration of the HPV vaccine effectiveness in African American women.

This study contributes to positive social change within the community and the public health profession through the areas of research, policy, and practice. First, research will

better help individuals and communities understand the HPV vaccination disparities that exist among African American women as well as why the current vaccinations are not necessarily protective in African American women. Next, based on the research findings, policies and new vaccines can be created to ensure that the most effective and equitable practices and education are being executed and relayed to African American women via health professionals, physicians, pharmaceutical companies, etc. Lastly, more interventions can be implemented to help with this very preventable disease, resulting in a decrease in morbidity and/or mortality of HPV and cervical cancer among African American women.

Summary and Conclusions

Section 1 intricately described personal history of HPV, reduced access to healthcare, and risky sexual behaviors and the literature pertaining to African American women. Additionally, the purpose of the study, the nature of the study, the research questions and hypotheses, and a detailed literature review with emphasis on limitations, delimitations and assumptions were provided. This section concluded with a description of the positive social change impact of the study. The subsequent section, Section 2, focuses primarily on the research design and rationale, methodology, and threats to validity.

Section 2: Research Design and Data Collection

Introduction

The purpose of this study was to determine the relationships between use of HPV vaccination and personal history of HPV, reduced access to healthcare, and risky sexual behaviors in African American women, ages 18–49. This section includes the research design and rationale, methodology, and threats to validity.

Research Design and Rationale

The identified independent variables were personal history of HPV, reduced access to healthcare, and risky sexual behaviors. The dependent variable was use of HPV vaccination for cervical cancer prevention. The covariates of this study were age, marital status, annual household income, and educational attainment, which were controlled for using a logistic regression analysis. I utilized a quantitative, cross-sectional study design using secondary NHANES data collected during 2013 and 2014 due to its cost and time effectiveness, I used the data to assess the prevalence of HPV vaccination use and selected characteristics of the identified target population previously mentioned.

Methodology

In this section I defined how the study was conducted. I also discussed the study population, sampling and sampling procedures used to collect data as described in secondary data materials, instrumentation and operationalization of constructs, threats to validity, and ethical procedures.

Population

As shown in Appendix C, NHANES unweighted sample size included 10,175 girls and women of all age ranges. However, the target population for this study was African American women between the ages of 18 and 49. As a result of this studies' inclusion and exclusion criteria, the sample population was *n*=229.

Sampling and Sampling Procedures Used to Collect Data

According to the CDC (2013), data from NHANES are not acquired using a simple random sample. Instead, data are collected using a "complex, multistage, probability sampling design" that is used to choose participants that are representative of the "civilian, non-institutionalized US population" (CDC, 2013, para. 3). This complex, multistage probability sample excludes individuals who reside in nursing homes, are members of the armed forces, are institutionalized, and United States nationals living abroad (CDC, 2013). Furthermore, according to the CDC,

> Sample selection for NHANES followed these stages, in order: 1. Selection of primary sampling units (PSUs), which are counties or small groups of contiguous counties. 2. Selection of segments within PSUs that constitute a block or group of blocks containing a cluster of households. 3. Selection of specific households within segments. 4. Selection of individuals within a household; see the ''Household Interview'' section for more information on sample person selection. (2013, para. 3)

I utilized NHANES' public 2013–2014 datasets and questionnaires. Because information pertaining to the access of NHANES datasets is made available for data users and researchers throughout the world online, it was not necessary to request permission to gain access to the data that I used. To obtain the data, I completed the following steps, which is shown in Figure 3:

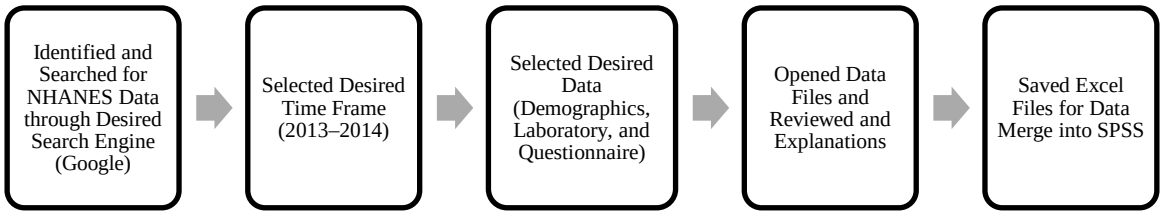

Figure 3. Accessing NHANES data.

Inclusion and exclusion criteria. African American women between the ages of 18 and 49 are included in this study. Women who had a positive pregnancy test at the time of exam were excluded from this study.

Sample size. From 2013–2014, a total of 14,332 persons were selected for 30 different NHANES survey locations (CDC, 2017c). Of these, 10,175 people completed the interview and 96% (9,813) of these individuals were examined (CDC, 2017c). From this, 229 African American women between the ages of 18 and 49 were used for this study.

Justification for the effect size, alpha level, and power level. I chose the minimum effect size to allow for best external validity since this study was a multistage, probability sampling design. I chose an alpha level of .05 to reduce Type 1 error while

the power level of .80 reduced Type 2 error, according to Creswell (2013). I added a nonresponse/attrition factor of 10% to account for nonresponse/attrition of selected women. The choice of these figures was made for better external validity and improved outcomes from generalization of the study findings, according to Sullivan (2012). Also, I conducted a post hoc power analysis to evaluate the achieved statistical power, please see p. 41 of Section 3 for more details.

Instrumentation and Operationalization of Constructs

NHANES serves as a great tool for conducting research on the health and nutrition of household populations in the United States (CDC, 2016). NHANES data has been used to influence policy, create health programs and services, expand knowledge about the health of people in the United States, and improve the health of the United States population, such as removing lead from gasoline, establishing national baseline estimates for cholesterol, blood pressure, and Hepatitis C, and creating and updating pediatric growth charts (CDC, 2016). I utilized NHANES data for this study to explore the many factors that influence use of HPV vaccination for cervical cancer prevention in African American women.

Data have been collected by NHANES since 1959 in three separate time periods: The National Health Examination Survey (NHES) era (1959–1970), the periodic and population-specific NHANES era (1971–1994), and the continuous NHANES era from 1999 forward (Zipf, G., Chiappa, M., Porter, KS et al., 2013). Since 1999, the National Center for Health Statistics has released public use data from the continuous NHANES in two year cycles (Zipf, G., Chiappa, M., Porter, KS et al., 2013). As previously

mentioned, I utilized data from 2013–2014. I also used three out of six available datasets: demographics (population characteristics), laboratory (disease results), and questionnaire (lifestyle behaviors) which all contained relevant variables for this study.

Operationalization. The independent variables for this study were personal history of HPV, reduced access to healthcare, and risky sexual behaviors. I defined personal history of HPV as ever being told by a doctor one had HPV. I defined reduced access to healthcare by whether an individual was covered by health insurance ("yes" or "no"), whether the person had a routine place to go for healthcare ("yes" or "no"), and the number of times healthcare had been received over the past year (0, 1–3, and ≥4). Lastly, I defined risky sexual behaviors as if one had ever engaged in sex without use of condom, the number of sexual male partners, and coitarche – age at first sexual intercourse. My dependent variable was use of HPV vaccination and was defined by whether an individual had ever received a Gardasil or Cervarix HPV vaccination. This variable was categorical ("yes" or "no").

The covariates I used in this study were age, marital status, educational attainment, and annual household income. I selected covariates based on statistical, social, and biological relationships with HPV. Age was categorized into the following groups: 18–34 and 35–49. Marital status was categorized as married, widowed, divorced, separated, never married, or living with a partner. Educational attainment was categorized as less than 9th grade, Grades 9–12, having attained a high school diploma/GED or equivalent, having attended some college or attained an associate's

degree, and having completed college or above. Annual household income was categorized as ≤$39,999, $40,000-$59,999, $60,000-$75,999, and ≥$80,000.

Data analysis plan. I analyzed data using the Statistical Package for Social Sciences® (SPSS) version 21. The phases of the analysis are shown in Figure 4. I validated data by using the SPSS Data Validation add-on module, which enabled users to identify doubtful or unsound cases, variables, and data values, view patterns of missing data, and summarize variable distributions, thus allowing users to determine data validity and removing or correcting cases prior to analysis (SPSS, 2014). To ensure accurate and effective data analyses, identified variables were recoded and manipulated in line with the research questions and data operationalization plans. Descriptive statistics were created and the results were used to create tables and charts. Univariate (simple frequencies and percentages), bivariate (Pearson's correlation coefficient, Chi-Square analyses), and logistic regression analyses were performed to identify relationships, measure levels of significance of associations between independent and dependent variables, and to reduce statistical errors. Furthermore, *p*-values, adjusted odds ratios and 95% confidence intervals (CIs) were calculated. A summary of the statistical procedures and the relevant questions and hypotheses is provided in Table 1.

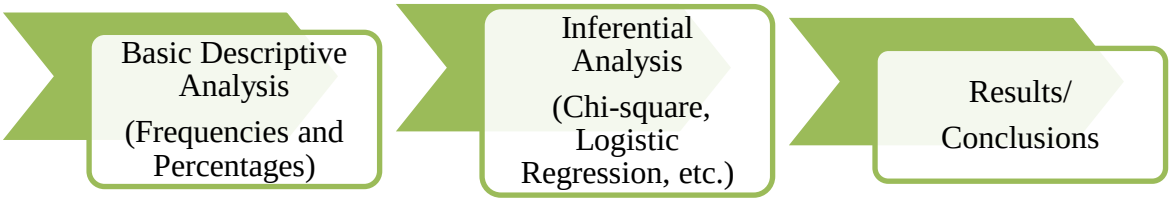

Figure 4. Data analysis process.

Table 1

Research Questions, Hypotheses, and Appropriate Statistical Procedures

Research Question	Hypothesis	Variables	Statistical Procedure
Is there an association between use of HPV vaccination and personal history of HPV among African American women, ages 18–49?	There is an association between use of HPV vaccination and personal history of HPV among African American women, ages 18–49.	DV- HPV vaccination use IV- Personal history of HPV	Bivariate chi-square analysis and logistic regression
Is there an association between use of HPV vaccination and reduced access to healthcare among African American women, ages 18–49?	There is an association between use of HPV vaccination and reduced access to healthcare among African American women, ages 18–49.	DV- HPV vaccination use IV- Reduced access to healthcare	Bivariate chi-square analysis and logistic regression
Is there an association between use of HPV vaccination and risky sexual behaviors among African American women, ages 18–49?	There is an association between use of HPV vaccination and risky sexual behaviors among African American women, ages 18–49.	DV- HPV vaccination use IV- Risky sexual behaviors	Bivariate chi-square analysis and logistic regression

Research Questions and Hypothesis

I sought to explore the use of the HPV vaccination for cervical cancer prevention in African American women. The research questions and hypotheses were as follows:

RQ1: Is there an association between use of HPV vaccination and personal history of HPV among African American women, ages 18–49?

$H_0$1: There is no association between use of HPV vaccination and personal history of HPV among African American women, ages 18–49.

$H_0$1: There is an association between use of HPV vaccination and personal history of HPV among African American women, ages 18–49.

RQ2: Is there an association between use of HPV vaccination and reduced access to healthcare among African American women, ages 18–49?

$H_0$2: There is no association between use of HPV vaccination and reduced access to healthcare among African American women, ages 18–49.

$H_0$2: There is an association between use of HPV vaccination and reduced access to healthcare among African American women, ages 18–49.

RQ3: Is there an association between use of HPV vaccination and risky sexual behaviors among African American women, ages 18–49?

$H_0$3: There is no association between use of HPV vaccination and risky sexual behaviors among African American women, ages 18–49.

$H_0$3: There is an association between use of HPV vaccination and risky sexual behaviors among African American women, ages 18–49.

Threats to Validity

Cross-sectional study designs are limited in establishing causal relationships and directionality (Frankfort-Nachmias & Nachmias, 2008). In addition, cross-sectional study designs are used to describe the pattern of relationship between variables and as a result, the elements of manipulation and control that are present in true experimental designs are absent in these designs (Frankfort-Nachmias & Nachmias, 2008).

NHANES oversamples certain population subgroups in efforts to increase the reliability and precision of health status indicator estimates for these groups (CDC, 2013). Since this study involved the analysis of secondary data, there may be threats to content and construct validity of this study. For example, internal validity was affected due to missing data from variables, other unaccounted errors in the data collection itself, and response and measurement bias. In addition, since data from 2013–2014 was studied, there may have been a significant change in variables, participant responses, or other factors that could have altered or skewed responses throughout the years analyzed. Lastly, this study included a small sample size of African American women, which may not be the representative of larger African American populations of women.

Ethical Procedures

This study did not have any direct contact with human subjects as it involved analysis of secondary data collected from 2013 and 2014. In 2003, the NHANES Institutional Review Board (IRB) changed its name to the NCHS Research Ethics Review Board (ERB) (CDC, 2017b). The NCHS Research Ethics Review Board reviewed the request for continuation of Protocol #2011- 17- NHANES Survey, which included 2013–

2014 datasets and was approved (CDC, 2017b). In regards to the confidentiality of participants, CDC ensured all human subjects that all data collected would be held in the strictest confidence (CDC, 2017b). CDC also provided information to participants regarding confidentiality of information relative to the Public Health Service Act (42 USC 242k) (authorizes collection) and Section 308(d) of that law (42 USC 242m), the Privacy Act of 1974 (5 USC 552A), and the Confidential Information Protection and Statistical Efficiency Act (PL 107-347) (CDC, 2017b). To ensure complete, safe, and secure data, code numbers were assigned in place of names or other personal identifiers (CDC, 2017b). Furthermore, ethical approval was sought and approved by the Walden University Institutional Review Board (IRB Approval Number 06-09-17-0568615).

Dataset treatment post-analysis. Secondary NHANES data used in this study were examined without full disclosure of personal information and identifiers in order to avoid an ethical breach. Any breach in data or release of data would be resolved by NHANES. All data utilized for this study was saved on a Lexar encrypted flash drive, and will be properly deleted from the corresponding technological device after five (5) years, in pursuant with Walden University IRB guidelines.

Summary

In summation, this section discussed the research design (cross-sectional, quantitative), rationale and methodology of the study. The methodology section described the study population (African American women ages 18–49 from the United States noninstitutionalized population (NHANES 2013–2014), secondary data management, sampling and sampling procedures, and instrumentation and

operationalization of constructs. When describing the instrumentation and operationalization of constructs, the dependent and independent variables, the data collection and management techniques, and the data analysis plan were all described. Additionally, this section discussed threats to validity, ethical considerations, and dataset treatment post analysis. The next section, Section 3, presents the results and findings of this study. This section also discusses the period for data collection, the actual recruitment and the response rate of participants, and discrepancies in the use of the secondary dataset. Descriptive and demographic characteristics of the sample, basic univariate, and bivariate and multivariate analyses are also presented.

Section 3: Presentation of the Results and Findings

Introduction

The purpose of this quantitative study was to explore the relationship between use of HPV vaccination and personal history of HPV, reduced access to healthcare, and risky sexual behaviors among African American women, ages 18–49, living in the United States. Section 3 includes results of statistical analysis on data collected from NHANES. In this section I provided a description of the timeframe and sample population demographics, representativeness of the sample, and univariate characteristics and analysis of the sample. The study results subsection includes the results of the chi-square tests for RQ1, RQ2, and RQ3, and the multivariate logistic regression model.

Data Collection of Secondary Data Set

Each year, approximately 5,000 individuals of all ages are interviewed in their homes and complete the health examination component of the survey, which is conducted in a mobile examination center (MEC; CDC, 2017c). NHANES data files contain information pertaining to demographics, diet, examination and laboratory history, and questionnaires. As previously mentioned, I utilized 2013–2014 data as it pertained to population characteristics (demographics), disease/infection-related results (laboratory), and lifestyle behaviors (questionnaire) to conduct chi-square and logistic regression analyses on HPV vaccination, as identified by the research questions of this study.

Time Frame and Response Rates

According to NHANES, data proposals begin 2 years prior to the actual survey time frame (see Appendix B for more information on content planning process and data release schedule). Data proposals for 2013–2014 data files launched in 2011. A total of 5,172 women (unweighted sample size) were interviewed, which produced a 71.4% response rate (please see Appendix C for more information on unweighted response rates for NHANES 2013–2014). However, only 4,982 women (unweighted sample size) were examined, producing a 68.8% response rate (please see Appendix C). For the purposes of this study, only 229 African American women were studied. Due to the lack of responses from African American women, many of the data variables were subject to missing values. Although the sample used in this study (229 women) was smaller than initially planned, adequate statistical power was achieved (>0.90) due to the high effect size detected in the regression analysis (7.227, Table 12, G*Power Calculator) (Erdfelder, Faul, & Buchner, 1996).

Descriptive Demographics of the Sample

The sample population was 229 African-American women. All 229 women responded to questions regarding reduced access to healthcare and risky sexual behaviors. All respondents were between the ages of 18–49, the average age being 32.50.

Representativeness of the Sample

According to the NHANES (CDC, 2017c), the sample for the survey is selected to be representative of the United States population of all ages. In efforts to obtain responses from samples that are representative of certain age groups and racial/ethnic

groups, NHANES over-samples individuals 60 and older and African American and Hispanic populations (CDC, 2017c). Of the 5,000 households selected for NHANES, 229 African American women ages 18–49 formed the study sample.

Study Results

Univariate Characteristics of the Sample

Nearly 60% of women included in this study were between the ages of 18 and 34. Fifty-two percent (52.8%) of the women were never married. Nearly 40% (39.6%) attended some college or obtained an associate's degree, while 16.2% were college graduates. All the women had an annual household income less than or equal to $39,999 (100%). Seventy-one percent (71.2%) of the women had health insurance coverage. Nearly 90% of the women had a routine place to go for healthcare, and 87.3% had received healthcare at least once over the past year. Eighty percent (80%) of women had engaged in some form of risky sexual behavior. Eighty-six percent (86.4%) of women stated they had never been told by a doctor they had HPV, while 83.3% had never received the HPV vaccination.

In this section I displayed the study results for each research question. To determine whether there was an association between use of HPV vaccination and personal history of HPV, reduced access to healthcare, and risky sexual behaviors among African American women ages 18–49, I conducted chi-square tests. Table 2 displays the demographic and behavioral characteristics of the population. Table 3 displays the distributions of and the chi-square results for population demographics and behavioral characteristics by HPV vaccination. Table 4 displays the statistical cross-tabulation for

HPV infection by HPV vaccination. Tables 5-7 display the statistical cross-tabulations associated with reduced access to healthcare. Statistical cross-tabulations between risky sexual behaviors and HPV vaccination are displayed in Tables 8-11. The logistic regression of covariates by HPV vaccination is shown in Table 12. All the results are discussed per research question and per table below.

Table 2

Univariate Descriptive Analyses of Population Demographics and Behavioral Characteristics

N = 229	*n*	%
Age		
18–34	134	58.5
35–49	95	41.5
Marital status		
Married	49	21.4
Widowed	2	.9
Divorced	25	10.9
Separated	5	2.2
Never married	121	52.8
Living with partner	27	11.8
Educational attainment		
Less than 9th grade	6	2.8
Grades 9–12	38	17.1
High school graduate/GED or equivalent	54	24.3
Some college or Associate's degree	88	39.6
College graduate or above	36	16.2
Annual household income		
≤ $39,999	227	100
Health insurance coverage		
Yes	163	71.2
No	66	28.8
Routine place to go for healthcare		
Yes	205	89.5
No, there is no place to go	24	10.5
Number of times healthcare has been received in the last year		
0	29	12.7
1–3	154	67.2
≥4	46	20.1
Ever engaged in risky sexual behaviors		
Yes	183	80.0
No	46	20.0
Ever been told by a doctor you had HPV		
Positive		
Negative	6	13.6
Ever received HPV vaccination	38	86.4
Yes	37	16.7
No	185	83.3

*Note: Those with missing information were excluded from percentages.

Table 3

Distribution of Population Demographics and Behavioral Characteristics and Statistical Cross-tabulations for them by HPV Vaccination

N = 229	Received HPV Vaccination				
	Yes		No		Chi-square
	n	%	n	%	*p-value*
Age					
18–34	33	89.0	98	53.0	<.0001
35–49	4	11.0	87	47.0	
Marital status					
Married	4	10.8	44	23.7	.173
Widowed	0	0.0	2	1.0	
Divorced	3	8.1	22	12.0	
Separated	1	2.7	4	2.2	
Never married	27	73.0	91	49.1	
Living with partner	2	5.4	22	12.0	
Educational attainment					
Less than 9^{th} grade	2	5.4	3	1.6	.102
Grades 9–12	8	21.6	30	17	
High school graduate/GED or equivalent	5	13.5	47	26.4	
Some college or Associate's	19	51.4	66	37	
degree	3	8.1	32	18	
College graduate or above					
Annual household income	37	100	183	100	NR
≤ $39,999					
Health insurance coverage	26	70.0	132	71.3	.895
Yes	11	30.0	53	28.7	
No					
Routine place to go for healthcare	33	89.2	165	89.2	1.00
Yes	4	10.8	20	10.8	
No, there is no place to go					
Number of times healthcare has been received in the last year	4	11.0	24	13.0	.108
0	21	57.0	129	70.0	
1–3	12	32.0	32	17.0	
≥4					
Ever engaged in risky sexual behaviors					
Yes	30	81.0	148	80.0	.880
No	7	19.0	37	20.0	
Ever been told by a doctor you had HPV					
Yes	0	0	5	15	.190
No	10	100	28	85	

RQ1: Is there an association between use of HPV vaccination and personal history of HPV among African American women ages 18–49?

Nearly 12% (11.6%) of the women in the sample had a history of HPV. About 15% (15.2 %) of those who did not receive HPV vaccine had a history HPV. Having HPV was not significantly associated with HPV vaccination among African American women ages 18–49 in the United States (χ^2=1.715, p=0.190), which is shown in Tables 3 and 4. As a result, there was not sufficient evidence to reject the claim that there is no association between use of HPV vaccination and personal history of HPV among African American women, ages 18–49. This implies that personal history of HPV among African American women does not impact HPV vaccination.

Table 4

Statistical Cross-tabulation for HPV Infection by HPV Vaccination

Received HPV vaccine * Ever told by doctor you had HPV Cross-tabulation

			Ever told by doctor you had HPV		Total
			Yes	No	
Received HPV vaccine	Yes	Count	0	10	10
		% within Received HPV vaccine	0.0	100	100
	No	Count	5	28	33
		% within Received HPV vaccine	15.2	84.8	100
Total		Count	5	38	43
		% within Received HPV vaccine	11.6	88.4	100

RQ2: Is there an association between use of HPV vaccination and reduced access to healthcare among African American women ages 18–49?

About seventy one percent (71.2%) of women were covered by health insurance, while 11.7% of those covered by health insurance received the HPV vaccine. Health insurance coverage was not significantly associated with HPV vaccination among African American women ages 18–49 in the United States (χ^2=0.018, p=0.895), which is shown in Tables 3 and 5. The results suggest that insurance status does not impact HPV vaccination. Next, having a routine place to go for healthcare was not significantly associated with HPV vaccination among African American women ages 18–49 in the United States (χ^2=0.000, p=1.000), which is shown in Tables 3 and 6. The results suggest that having a routine place to go for healthcare does not impact HPV vaccination. About 89% (89.2%) of the patients had a routine place to go for healthcare, while 10.8% of women had no routine place to go for healthcare. Lastly, receiving healthcare in the last year was not significantly associated with HPV vaccination among African American women ages 18–49 in the United States (χ^2=0.018, p=4.45), which is shown in Tables 3and 7. More than 12% (12.6%) of women had not received any healthcare within the last year, while 67.6% of women received healthcare 1–3 times last year. Due to the findings, there is not sufficient evidence to reject the claim that there is no association between use of HPV vaccination and reduced access to healthcare among African American women ages 18–49 in the United States.

Table 5

Statistical Cross-tabulation for Health Insurance Coverage by HPV Vaccination

Crosstab

			Covered by health insurance?		Total
			Yes	No	
Received HPV vaccine	Yes	Count	26	11	37
		% within Received HPV vaccine	70.3%	29.7%	100.0%
	No	Count	132	53	185
		% within Received HPV vaccine	71.4%	28.6%	100.0%
Total		Count	158	64	222
		% within Received HPV vaccine	71.2%	28.8%	100.0%

Table 6

Statistical Cross-tabulation for Routine Healthcare Place by HPV Vaccination

Crosstab

			Routine place to go for healthcare		Total
			Yes	There is no place	
Received HPV vaccine	Yes	Count	33	4	37
		% within Received HPV vaccine	89.2%	10.8%	100.0%
	No	Count	165	20	185
		% within Received HPV vaccine	89.2%	10.8%	100.0%
Total		Count	198	24	222
		% within Received HPV vaccine	89.2%	10.8%	100.0%

Table 7

Statistical Cross-tabulation for Healthcare Received by HPV Vaccination

Crosstab

			# of times healthcare received in last year			Total
			0	1–3	≥4	
Received HPV vaccine	Yes	Count	4	21	12	37
		% within Received HPV vaccine	10.8%	56.8%	32.4%	100.0%
	No	Count	24	129	32	185
		% within Received HPV vaccine	13.0%	69.7%	17.3%	100.0%
Total		Count	28	150	44	222
		% within Received HPV vaccine	12.6%	67.6%	19.8%	100.0%

RQ3: Is there an association between use of HPV vaccination and risky sexual behaviors among African American women, ages 18–49?

Engaging in risky sexual behavior was not significantly associated with HPV vaccination among African American women ages 18–49 in the United States (χ^2=0.023, p=0.880), which is shown in Tables 3 and 8. The results suggest that engaging in risky sexual behaviors does not impact HPV vaccination. To further describe data, analyses were conducted on individual variables that make up risky sexual behaviors: condom use, coitarche, and number of male sexual partners, and are shown in Tables 9-11. Condom use was not significantly associated with HPV vaccination among African American women ages 18–49 in the United States (χ^2=0.284, p=0.868), which is shown in Tables 3

and 9. These results suggest that having sex without the use of condom does not impact HPV vaccination. Coitarche, which is shown in Tables 3 and 10, was not significantly associated with HPV vaccination among African American women ages 18–49 in the United States (χ^2=0.985, p=0.611). These results suggest that the age at which a woman has sex for the first time does not impact HPV vaccination. Lastly, number of male sexual partners, which is shown in Tables 3 and 11, was not significantly associated with HPV vaccination among African American women ages 18–49 in the United States (χ^2=1.433, p=0.489). Based on findings, there is not sufficient evidence to reject the claim that there is no association between use of HPV vaccination and risky sexual behavior among African American women ages 18–49.

Table 8

Statistical Cross-tabulation for Risky Sexual Behaviors by HPV Vaccination

Crosstab

			Risky sexual behavior		Total
			Yes	No	
Received HPV vaccine	Yes	Count	30	7	37
		% of Total	13.5%	3.1%	16.6%
	No	Count	148	37	185
		% of Total	66.6%	16.7%	83.3%
Total		Count	178	44	222
		% of Total	80.2%	19.8%	100%

Table 9

Statistical Cross-tabulation for Condom Use by HPV Vaccination

Crosstab

			Ever received HPV vaccine		Total
			Yes	No	
# of times you had sex without the use of a condom within the past year	Never	Count	3	11	14
		% of Total	4.7%	17.2%	21.9%
	Inconsistent	Count	4	23	27
		% of Total	6.2%	35.9%	42.2%
	Always	Count	4	19	23
		% of Total	6.2%	29.7%	35.9%
Total		Count	11	53	64
		% of Total	17.2%	82.8%	100.0%

Table 10

Statistical Cross-tabulation for Coitarche by HPV Vaccination

Crosstab

			Ever received HPV vaccine		Total
			Yes	No	
How old when you first had sex	13 or younger	Count	1	9	10
		% of Total	1.2%	10.5%	11.6%
	14-17	Count	11	35	46
		% of Total	12.8%	40.7%	53.5%
	greater than or equal to 18	Count	6	24	30
		% of Total	7.0%	27.9%	34.9%
Total		Count	18	68	86
		% of Total	20.9%	79.1%	100.0%

Table 11

Statistical Cross-tabulation for Number of Male Sexual Partners by HPV Vaccination

Crosstab

			Ever received HPV vaccine		Total
			Yes	No	
# of Male Sexual Partners in Lifetime	1-5	Count	4	19	23
		% of Total	7.7%	36.5%	44.2%
	6-10	Count	5	11	16
		% of Total	9.6%	21.2%	30.8%
	Greater than or Equal to 11	Count	2	11	13
		% of Total	3.8%	21.2%	25.0%
Total		Count	11	41	52
		% of Total	21.2%	78.8%	100.0%

Logistic Regression

Table 12 displays the logistic regression of HPV vaccination by Covariates. Variables controlled for were age, marital status, educational attainment, and income. After adjustments, marital status, educational attainment, and income were not statistically significant. However, age was statistically significant. Women between the ages of 18 and 34 were 7.22 times as likely to receive the HPV vaccine as women aged 35–49 years (*OR*: 7.22; 95% *CI*: 2.36 – 22.13). Confidence intervals were relatively wide possibly due to the small sample size of this study.

Table 12

Logistic Regression of HPV Vaccination by Covariates

	HPV Vaccination	
N = 229	OR	95% CI
Age		
18–34	7.227	(2.360 – 22.133)
35–49	Ref	Ref
Marital Status		
Married	0.751	(0.228 – 2.474)
Not Married	Ref	Ref
Educational attainment		
Less than 9th grade	Ref	Ref
Grades 9–12	0.552	(0.070 – 4.350)
High school graduate/GED or equivalent	0.193	(0.023 – 1.596)
Some college or Associate's degree	0.559	(0.078 – 3.989)
College graduate or above	0.212	(0.022 – 2.028)
Income		
≤ $39,999	>999.999	(<.0001 – >999.999)
Greater than or equal to $39,999	Ref	Ref

Summary

In conclusion, there is no association between use of HPV vaccination and personal history of HPV, reduced access to healthcare, and risky sexual behaviors among African American women in the United States between the ages of 18 and 49. However, there was a statistically significant association between age and receipt of HPV vaccination with women aged 18–34 being more than seven times as likely as women aged 35–49 to have received the vaccination (*OR*: 7.22; 95% *CI*: 2.36 – 22.13). Section 4 serves as an overview of the interpretations, limitations, recommendation, and conclusions that are relevant to this doctoral study. A comparison of findings to relevant literature is also provided in Section 4.

Section 4: Application to Professional Practice and Implications for Social Change

Introduction

The purpose of this quantitative study was to explore the relationship between the receipt of HPV vaccination for cervical cancer prevention and personal history of HPV, reduced access to healthcare, and risky sexual behaviors in African American women ages 18–49. Overall there was no association between receipt of HPV vaccination and any of these variables. However, there was a statistically significant association between receipt of HPV vaccination and age. This section includes an interpretation of the findings, limitations of the study, recommendations for further study, and implications for professional practice positive social change.

Interpretation of the Findings

The analyses of the NHANES data indicated no significant associations between receipt of HPV vaccination and personal history of HPV, reduced access to healthcare, risky sexual behaviors, and most of the covariates investigated (i.e. marital status, educational attainment, and annual household income). In the following subsection, I compared findings to the literature and discussed this study's significant result, age.

Findings to Literature

Personal history of HPV. In 2015, Strohl et al. sought to study the knowledge of HPV, cervical cancer, and HPV vaccination in African American women living in urban Chicago. The authors concluded that knowledge of HPV, cervical cancer, and HPV vaccination was low in this population. Laz, Rahman and Berenson (2012) conducted a study to provide an update on HPV vaccine initiation among women between the ages of

18 and 26. The results showed that 77.3% of the women were not vaccinated. Lastly, Okafor, Hu and Cook (2015) sought to determine the association between racial/ethnic status and uptake and completion of the HPV vaccine series in college women. This study also found low initiation of the HPV vaccination among black women. While this current study did not study explore knowledge of HPV, cervical cancer, and HPV vaccination, it did show that women between the ages of 18 and 34 were 7.22 times as likely to receive the HPV vaccine as women aged 35–49 years (*OR*: 7.22; 95% *CI*: 2.36 – 22.13)..

Reduced access to healthcare. Wong and Do (2012) used the 2007 Health Information National Trends Survey (HINTS) to examine predictors of physician/patient discussion regarding the HPV vaccine in women 18 and older. The authors found a statistically significant association between lower income and education levels and a lower likelihood of HPV vaccine awareness. The current study did not find a statistically significant association between lower income and education level and a lower likelihood of HPV vaccine awareness. Brown, Wilson, Boothe and Harris (2011) studied the knowledge, attitudes, beliefs, and practices of ethnically diverse black women regarding cervical cancer screening and found that reduced access to healthcare was a major barrier to receiving the HPV vaccination. In the current study, 71% of women had health insurance, nearly 90% of women had a routine place to go for healthcare, and 67% of women had received healthcare 1–3 times in the last year. While reduced access to healthcare was not statistically significant, these results show that women in this sample do have access to healthcare and do see healthcare providers often. It could be further

suggested that health is important to these women despite the health outcomes often associated with this population compared to women of other racial/ethnic groups. Dempsey, Cohn, Dalton and Ruffin (2011) evaluated characteristics associated with HPV vaccine uptake among women between the ages of 19 and 26 seen in primary care, university-based clinics. One major finding of this study was that young adults had higher rates of being uninsured compared to other ages.

Risky sexual behaviors. Vázquez-Otero et al. (2016) examined whether HPV vaccination was associated with inconsistent condom use among college students between the ages of 18 and 26. The authors found no association between HPV vaccination and inconsistent condom use during vaginal, anal, or oral sex (Vázquez-Otero et al., 2016). These findings were consistent with previous studies, which also found no differences in the number of sex partners and frequency of condom use between individuals who were vaccinated and those who were not (Ratanasiripong, 2014). In a similar study, Mullins et al. (2016) sought to examine the association between risk perceptions after receiving the HPV vaccine and risky sexual behaviors and STI diagnosis over 30 months following vaccination. The authors found that while the greater perceived need for safer sexual behaviors following vaccination was associated with condom use, it was not associated with the number of sexual partners or STI diagnosis (Mullins et al., 2016). Lastly, Mayhew et al. (2014) assessed whether adolescent risk perceptions after the first vaccine dose predicted subsequent risky sexual behaviors and found that receiving the HPV vaccine did not alter risky sexual behaviors among adolescents. Similar to these studies, the current study found that engaging in

risky sexual behaviors was not statistically associated with receiving the HPV vaccination.

Age. Age was the only statistically significant factor in the current study. Women between the ages of 18 and 34 were 7.22 times as likely to receive the HPV vaccine compared to women aged 35–49 years (*OR*: 7.22; 95% *CI*: 2.36 – 22.13). Several studies also showed that age was statistically significant, $p < .05$, regardless of racial/ethnic group (Laz, Rahman, & Berenson, 2012; Okafor, Hu, & Cook, 2015; Wong & Do, 2012). These studies also showed that women who were middle aged were less likely to be aware of and knowledgeable of the HPV vaccine and had lower vaccine intake and completion rates compared to women of younger age groups. However, when stratified by race/ethnicity, black women were less likely to be aware of the HPV vaccine and less likely to be vaccinated. These study results suggest that it is important that young women be continuously targeted for HPV and cervical cancer prevention. This is especially vital due to the fact that many study results showed that as women become older, they are either less likely to be vaccinated, less likely to initiate and/or complete the recommended vaccine series, or less likely to be knowledgeable regarding HPV, cervical cancer, and the HPV vaccine (Okafor, Hu, & Cook, 2015; Strohl et al., 2015; Laz, Rahman, & Berenson, 2012).

Limitations of the Study

As previously mentioned, in this study there was a lack of female African American respondents, which is consistent with similar studies that had a small sample size and much missing data (Brown, Wilson, Boothe, & Harris; Okafor, Hu, & Cook,

2015; Strohl et al., 2015; Wong & Do, 2012). As a result of the small sample size, there was only one significant variable, age, when regression analysis was conducted. Next, personal history of HPV may not have been accurately captured due to self-reporting. Furthermore, it would have been interesting to know how many African American women died as a result of cervical cancer, and the rate at which African American women receive all three recommended doses of the HPV vaccine and follow the Pap smear guidelines but are still infected with HPV. However, NHANES does not currently provide this information.

According to current studies, there may be a relationship between alcohol consumption and persistent HPV (Schabath et al., 2014; Weiderpass et al., 2001). However, the current study was not able to analyze this variable due to missing data. Smoking is another factor linked to the potential development of HPV infection due to the carcinogens found in cigarette smoke which are capable of affecting multiple body organs, parts, and functions (Schmotzer, 2009; Menard, 2008). In fact, cigarette smoke metabolites and carcinogens have been found in the cells that line the cervix among women who smoke (Myatt, 2013). However, smoking was not included in the analysis of the current study due to the large amount of missing data. Lastly, parity was not analyzed in the current study due to the unavailability of this variable in NHANES (Opara & Zaidi, 2007). Parity has been shown to increase the risk of developing cancer following an HR-HPV infection (Borna, Tabassum, Jahan, Munshi & Unnesa, 2015).

Recommendations

Given the small sample size of the current study, there is a need to conduct an additional study that would recruit larger African American female populations. It would be also helpful to assess other racial/ethnic groups to better capture the disparities that exist regarding use of HPV vaccination. There is also a great need to further explore other health behaviors of African American women; especially because they are screened for cervical cancer as much as or more than Caucasian women but still die sooner. As previously mentioned, African American women who are vaccinated with Gardasil may not be protected against HPV (Vidal et al., 2014). A recommendation to utilize the Gene-Eden-VIR antiviral treatment, which has been noted as a safe and effective treatment against HPV in African American women, has been clinically proven to reduce HPV symptoms (Polansky & Itzkovitz, 2013). More education to the public and to African American women and clinical studies are needed to determine if this treatment is an alternative to the HPV vaccines that currently do not protect African American women from HPV infections.

Because age was the significant result in the current study with women aged 18–34 much more likely to receive HPV vaccination than 35–49 year olds, it would be beneficial for public health practitioners and physicians to conduct effective outreach to African American women between the ages of 18 and 34. Not only are African American women in this age range at risk for not receiving HPV vaccination, but they have the ability to influence other social and personal groups to receive and complete HPV vaccination. Lastly, it is extremely important that regardless of age, African

American women continuously encourage one another to get vaccinated and be compliant with screening recommendations for cervical cancer. Furthermore, it is necessary for public health practitioners to conduct outreach that is targeted towards African American women and to ensure that HPV and cervical cancer are discussed at healthcare visits. These outreach and education efforts can assist with increased knowledge and awareness of HPV and cervical cancer and the importance of still receiving the HPV vaccine despite current conversations and new studies surrounding the vaccine's ineffectiveness in African American women (i.e. an African American woman may feel that if the vaccine does not protect against the strains of HPV found in African American women, there is no benefit in vaccine intake and/or completion.

While the current study did include analysis of covariates analyzed in other studies, there were additional variables that could not be investigated. Alcohol consumption, tobacco consumption, and parity were not studied and should be further analyzed in future studies.

Implications for Professional Practice and Social Change

Bridging the gap between research, policy, and practice to improve public health and quality of life, and ultimately to affect positive social change, is essential. Additional research is needed to address why the current HPV vaccines are protective in certain racial/ethnic groups and any biological, genetic make-up, or underlying factors that may explain this anomaly. Furthermore, public health professionals and healthcare providers are needed to assist with initiating conversations in the African American community related to HPV and cervical cancer prevention. In terms of policy, there are currently

three states that require the HPV vaccine as a school requirement (Schwartz & Easterling, 2015). According to researchers, when children are receiving their preadolescent vaccines is a great opportunity for children to be administered the HPV vaccine. If there were laws mandating that schools nationwide make it a requirement for all children to receive the HPV vaccine, this could perhaps further educate parents and encourage them to receive the vaccine.

The current study can contribute to positive social change within the community and the public health profession. If age impacts vaccination knowledge and decisions, it is important that women especially of certain age groups be educated. In fact, a study by Watts et al. (2009) highlighted the significance of vaccine knowledge in a wide range of age groups among women. The authors examined attitudes regarding HPV vaccination in Latina and non-Latina women between the ages of 18 and 55 and found that the most common barriers to receiving the HPV vaccine were inadequate knowledge about the vaccine and the belief among mothers that their daughter did not have any risk factors for HPV infection. As a result, that study highlighted the importance of building a foundation of knowledge in individuals who are at-risk and to their caretakers and role models (i.e. mothers, grandmothers, friends, aunts, health advocates, teachers, etc.) who may provide the path to vaccination for all.

Given the prevalence of HPV infection and the cervical cancer mortality in the African American community, this study raises critical concerns on the need for improved education and outreach in this community. Future targeted public health education interventions should include partnerships with trusted community

organizations, such as schools, community-based clinics, churches, and businesses, to help assist in developing tailored, culturally informed, and community-supported messages.

Conclusion

The purpose of this quantitative study was to explore the relationship between the use of HPV vaccination and personal history of HPV, reduced access to healthcare, and risky sexual behaviors among African American women ages 18–49 in the United States. While this study found that no associations existed overall, age was statistically significant. Women between the ages of 18 and 34 were 7.22 times as likely to receive the HPV vaccine compared to women aged 35–49 years (*OR*: 7.22; 95% *CI*: 2.36 – 22.13). Thus, women who are in late adolescence and early adulthood are more likely to be vaccinated. Not only is it important that these groups be continuously targeted for HPV and cervical cancer prevention, but it is important that these groups of women assist in educating middle-aged women and mothers or caregivers of children to receive the HPV vaccine as well.

It is important to continue researching this topic and make political and practical recommendations to prevent cervical cancer among African American women. Given the promising scientific, medical, and technological advances in the prevention and early detection of cervical cancer in the United States, disparities in the use of these resources is concerning and is a reflection of a number of inadequacies in the country's health system. Given the ability to largely eradicate cervical cancer, the blatant racial disparities in prevalence and mortality rates are inexcusable and need to be addressed with urgency.

Future studies that integrate health belief modeling and drivers of health behavior may be of benefit on this issue, specifically in African American women. This will allow for a better understanding of the health behaviors, knowledge, and other factors that are placing African American women at the forefront of HPV infection and cervical cancer mortality. Public health education programs and interventions that focus on improving knowledge of HPV, cervical cancer, and HPV vaccination in adult African American women are necessary as a step towards positive social change in our world.

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Appendix A: List of Abbreviations

ACS – American Cancer Society

CDC – Centers for Disease Control and Prevention

CI – Confidence Interval

CIN – Cervical Intraepithelial Neoplasia

DV – Dependent Variable

FDA – Food and Drug Administration

HBM – Health Belief Model

HNSCC – Head and Neck Squamous Cell Carcinoma

HPV – Human Papillomavirus

HR – High Risk

IARC – International Agency for Research on Cancer

IRB – Institutional Review Board

IV – Independent Variable

LR – Low Risk

OR – Odds Ratio

NCI – National Cancer Institute

NCHS – National Center for Health Statistics

NHANES – National Health and Nutrition Examination Survey

NHIS – National Health Interview Survey

NIH – National Institutes of Health

SCC – Squamous Cell Carcinoma

SEER – Surveillance Epidemiology and End Results

SPSS – Statistical Package for the Social Sciences

STD – Sexually Transmitted Disease

STI – Sexually Transmitted Infection

USPSTF- United States Preventive Services Task Force

Appendix B: Content Planning Process and Data Release Schedule

CONTENT PLANNING PROCESS AND DATA RELEASE SCHEDULE

NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY (NHANES)

		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Type of Activity	Planning Activities			Solicit proposals for 2003-2004	Pilot test new 2003-2004 components	Solicit proposals for 2005-2006	Pilot test new 2005-2006 components	Solicit proposals for 2007-2008	Pilot test new 2007-2008 components	Solicit proposals for 2009-2010	Pilot test new 2009-2010 components
	Tabular Reports*		1999 data release in 4th quarter		2001 data release in 4th quarter	2002 data release in 4th quarter	2003 data release in 4th quarter	2004 data release in 4th quarter	2005 data release in 4th quarter	2006 data release in 4th quarter	2007 data release in 4th quarter
	Micro-data Files				1999/2000 release in 1st quarter		2001/2002 release in 1st quarter		2003/2004 release in 1st quarter		2005/2006 release in 1st quarter
	Dietary Data**				1999/2000 release in 1st quarter		2001/2002 release in 1st quarter***		2003/2004 release in 1st quarter		2005/2006 release in 1st quarter
	Data Center Access****				Data years 1999 and 2000	2001 + earlier years	2002 + earlier years*****	2003 + earlier years	2004 + earlier years	2005 + earlier years	2006 + earlier years
	Survey	NHANES 1999-2000		NHANES 2001-2002		NHANES 2003-2004		NHANES 2005-2006		NHANES 2007-2008	

* Release of limited data tables on specific topics of public health significance.

** Additional separate release of NHANES dietary recall in accordance with DHHS/USDA survey integration plans.

*** Without second day recall for 2002 to preserve confidentiality; USDA and HHS will work jointly to develop a bridging methodology to ensure comparability between data.

**** NHANES variables not released on micro-data files due to disclosure risks. See information on NCHS Research Data Center and the NCHS Policy on Release of Micro Data.

***** Includes second day recall for 2002.

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NHANES website: http://www.cdc.gov/nchs/nhanes.htm

03-0286 (9/03)

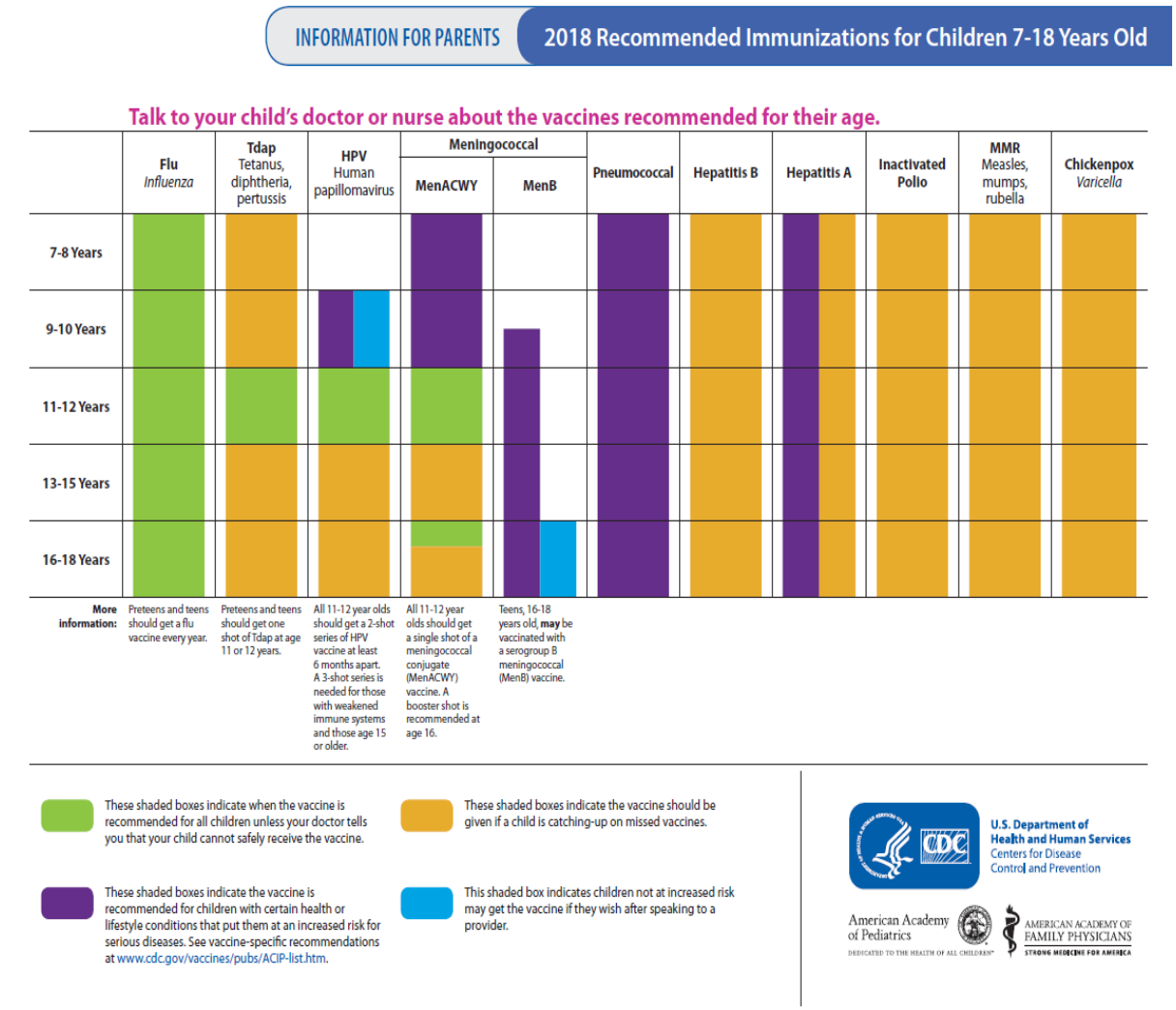
Appendix C: Unweighted Response Rates for NHANES 2013–2014

Unweighted Response Rates for NHANES 2013-2014 by Age and Gender

		Screened Sample		Interviewed Sample		Examined Sample	
Gender/	AGE GROUP	Control Totals	Sample Size 1	Unweighted Sample Size	Unweighted Response Rate (%)	Unweighted Sample Size	Unweighted Response Rate (%)
Total	All Ages	311,204,216	14,332	10,175	71.0	9,813	68.5
	<1 Year	3,690,728	493	405	82.2	391	79.3
	1 - 5 Years	20,161,812	1,517	1,198	79.0	1,131	74.6
	6 - 11 Years	24,636,333	1,726	1,371	79.4	1,312	76.0
	12 - 15 Years	16,665,816	941	737	78.3	713	75.8
	16 - 19 Years	16,897,931	878	695	79.2	678	77.2
	20 - 29 Years	42,954,403	1,338	956	71.4	919	68.7
	30 - 39 Years	40,062,072	1,379	998	72.4	961	69.7
	40 - 49 Years	41,526,121	1,545	1,035	67.0	1,007	65.2
	50 - 59 Years	43,132,547	1,426	939	65.8	916	64.2
	60 - 69 Years	32,593,982	1,460	940	64.4	918	62.9
	70 - 79 Years	17,986,736	894	549	61.4	535	59.8
	80+ Years	10,895,735	735	352	47.9	332	45.2
Male	All Ages	152,046,600	7,089	5,003	70.6	4,831	68.1
	<1 Year	1,868,652	244	201	82.4	194	79.5
	1 - 5 Years	10,324,016	775	627	80.9	598	77.2
	6 - 11 Years	12,566,660	897	708	78.9	678	75.6
	12 - 15 Years	8,563,669	484	375	77.5	365	75.4
	16 - 19 Years	8,604,976	423	334	79.0	327	77.3
	20 - 29 Years	21,425,377	667	468	70.2	453	67.9
	30 - 39 Years	19,678,163	676	483	71.4	461	68.2
	40 - 49 Years	20,312,008	776	478	61.6	464	59.8
	50 - 59 Years	20,910,896	704	455	64.6	443	62.9
	60 - 69 Years	15,453,171	715	454	63.5	442	61.8
	70 - 79 Years	8,177,325	413	259	62.7	253	61.3
	80+ Years	4,161,687	315	161	51.1	153	48.6
Female	All Ages	159,157,616	7,243	5,172	71.4	4,982	68.8
	<1 Year	1,822,076	249	204	81.9	197	79.1
	1 - 5 Years	9,837,796	742	571	77.0	533	71.8
	6 - 11 Years	12,069,673	829	663	80.0	634	76.5
	12 - 15 Years	8,102,147	457	362	79.2	348	76.1
	16 - 19 Years	8,292,955	455	361	79.3	351	77.1
	20 - 29 Years	21,529,026	671	488	72.7	466	69.4
	30 - 39 Years	20,383,909	703	515	73.3	500	71.1
	40 - 49 Years	21,214,113	769	557	72.4	543	70.6
	50 - 59 Years	22,221,651	722	484	67.0	473	65.5
	60 - 69 Years	17,140,811	745	486	65.2	476	63.9
	70 - 79 Years	9,809,411	481	290	60.3	282	58.6
	80+ Years	6,734,048	420	191	45.5	179	42.6

1. Gender sample sizes may not equal Total sample size due to a few unspecified gender designations in screened sample. However all sample persons in the interviewed and examined samples have a specified gender designation.

Appendix D: 2018 Recommended Immunizations



Appendix E: USPSTF Grades and Suggestions for Practice

Table 1. **What the USPSTF Grades Mean and Suggestions for Practice**

Grade	Definition	Suggestions for Practice
A	The USPSTF recommends the service. There is high certainty that the net benefit is substantial.	Offer or provide this service.
B	The USPSTF recommends the service. There is high certainty that the net benefit is moderate or there is moderate certainty that the net benefit is moderate to substantial.	Offer or provide this service.
C	*Note: The following statement is undergoing revision.* Clinicians may provide this service to selected patients depending on individual circumstances. However, for most individuals without signs or symptoms there is likely to be only a small benefit from this service.	Offer or provide this service only if other considerations support the offering or providing the service in an individual patient.
D	The USPSTF recommends against the service. There is moderate or high certainty that the service has no net benefit or that the harms outweigh the benefits.	Discourage the use of this service.
I Statement	The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of the service. Evidence is lacking, of poor quality, or conflicting, and the balance of benefits and harms cannot be determined.	Read the clinical considerations section of USPSTF Recommendation Statement. If the service is offered, patients should understand the uncertainty about the balance of benefits and harms.

Appendix F: Cervical Cancer Screening Recommendations

Summary of Recommendations and Evidence

Population	Recommendation	Grade (What's This?)
Women 21 to 65 (Pap Smear) or 30-65 (in combo with HPV testing)	The USPSTF recommends screening for cervical cancer in women age 21 to 65 years with cytology (Pap smear) every 3 years or, for women age 30 to 65 years who want to lengthen the screening interval, screening with a combination of cytology and human papillomavirus (HPV) testing every 5 years. See the Clinical Considerations for discussion of cytology method, HPV testing, and screening interval.	A
Women younger than 30 years, HPV testing	The USPSTF recommends against screening for cervical cancer with HPV testing, alone or in combination with cytology, in women younger than age 30 years.	D
Women younger than 21	The USPSTF recommends against screening for cervical cancer in women younger than age 21 years.	D
Women Older than 65, who have had adequate prior screening	The USPSTF recommends against screening for cervical cancer in women older than age 65 years who have had adequate prior screening and are not otherwise at high risk for cervical cancer. See the Clinical Considerations for discussion of adequacy of prior screening and risk factors.	D
Women who have had a hysterectomy	The USPSTF recommends against screening for cervical cancer in women who have had a hysterectomy with removal of the cervix and who do not have a history of a high-grade precancerous lesion (cervical intraepithelial neoplasia [CIN] grade 2 or 3) or cervical cancer.	D

This recommendation statement applies to women who have a cervix, regardless of sexual history. This recommendation statement does not apply to women who have received a diagnosis of a high-grade precancerous cervical lesion or cervical cancer, women with in utero exposure to diethylstilbestrol, or women who are immunocompromised (such as those who are HIV positive).