2021

The Effect of Race, Provider-Location Type, and Region on Adolescent HPV Vaccination

Erica Sade Hunter
Walden University

Walden University

College of Health Professions

This is to certify that the doctoral dissertation by

Erica S. Hunter

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee
Dr. Chester Jones, Committee Chairperson, Public Health Faculty
Dr. Gwendolyn Francavillo, Committee Member, Public Health Faculty
Dr. Simone Salandy, University Reviewer, Public Health Faculty

Chief Academic Officer and Provost
Sue Subocz, Ph.D.

Walden University
2021

Abstract

The Effect of Race, Provider-Location Type, and Region on Adolescent HPV Vaccination

by

Erica S. Hunter

MPH, Liberty University, 2015

BS, James Madison University, 2012

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health

Walden University

February 2021

Abstract

Studies have been conducted on various factors and their effect on human papillomavirus (HPV) vaccination uptake amongst adolescents. However, these studies typically point to communication factors and provider recommendations as having a significant effect on HPV vaccination uptake, ultimately leading to the need for more information on other factors that may increase HPV vaccination amongst adolescents. The purpose of this quantitative cross-sectional study was to determine if race, provider-location type, and region of the United States have a statistically significant effect on HPV uptake amongst adolescents. The 2018 National Immunization Survey (NIS) was used, and 34,980 participants were included in the sample. The theoretical framework used for this study was Hochman and Rosentsock's Health Belief Model (HBM). The HBM approach was used to explore the health behavior change process and the attitudes and perceptions amongst parents that are associated with HPV vaccination uptake amongst adolescents. Using the cross-sectional design, surveys from the NIS were analyzed using a binary logistic regression to determine whether race, provider-location type, and region of the United States have a statistically significant effect on HPV vaccination uptake amongst adolescents. The results of these analyses indicated that there was a statistically significant effect amongst race and region. Specifically, the White race residing in the Northeast, Midwest, and Southern regions were shown to have a statistically significant effect and an upward uptake on HPV vaccination amongst adolescents. Public health professionals and providers may benefit from the results of this study by identifying the areas that are shown to have a statistically significant effect on HPV vaccination uptake among adolescents.

The Effect of Race, Provider-Location Type, and Region on Adolescent HPV Vaccination

by

Erica S. Hunter

MPH, Liberty University, 2015

BS, James Madison University, 2012

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health

Walden University

February 2021

Dedication

I dedicate this research in loving memory of my Grandmother Juanita. From a little girl, she helped me to see a world of endless opportunities, and always supported me in all of my endeavors.

To my beautiful children, McArthur IV, McKenzie, and Midas, each of you have motivated me to be the best person I can be, I hope that you never stop reaching for your dreams.

To my father, Eric Sr. and my brothers, Eric Jr. and JeJuan, thank you for your unconditional love and constant support.

To Amber, my deepest gratitude, your endless encouragement, your understanding, and your selflessness, I am eternally grateful.

Acknowledgements

I would like to acknowledge my committee members, Dr. Chester Jones, and Dr. Gwendolyn Francavillo, for their guidance, support, and dedication in mentoring me throughout this process.

Finally, I would like to acknowledge my loving mother, Deneen, for her patience, continuous support, assisting wherever there was a need and always believing in me, and for that I am forever grateful.

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction to the Study

Background of the Study

The human papillomavirus (HPV) vaccine is an essential element in the prevention of cancer and has the ability to save lives. HPV is a vaccine that is needed, but not always consistently administered. HPV affects approximately 14 million people in the United States each year and has the ability to cause certain types of cancers in both men and women (CDC, 2017). The cancers most commonly associated with HPV include cancer of the cervix, oropharyngeal, vulva, vagina, penis, and anus (CDC, 2017).

HPV is the most common sexually transmitted infection, and due to its prevalence, it is predicted that all persons that are sexually active will get the virus at a point in their lives if they have not received the HPV vaccine (CDC, 2017). Unfortunately, HPV vaccination rates in the United States have consistently staggered in comparison to other vaccines (CDC, 2017). In 2017, only 49% of adolescents were up to date on the HPV vaccine, and 66% of adolescent's ages 13 to 17 received the first dose of the HPV vaccine series (CDC, 2018). Although research has been conducted on the communication factors of HPV, there is limited research on the specific factors that affect HPV vaccine uptake in adolescents. No research was found that looked into determining whether there were specific factors such as race, geographical region, and provider-location type in a cohesive manner.

A retrospective analysis of existing data can provide a look into whether there are factors that affect HPV vaccine uptake among adolescents. The aim of this study was to determine whether there is an effect between an adolescent's race, geographical region of

the United States, and provider-location type on HPV vaccination uptake amongst adolescents.

Problem Statement

Vaccine misconceptions occur frequently, and health care providers can play a significant role in addressing fallacies. Communication about HPV vaccination occurs in several ways, from direct conversations with providers and nurses to outreach from state and local health departments (Hendrix, 2015). Currently, no studies exist that aid in determining the cohesive effect of race, provider-location type, and geographical region of the United States, on HPV vaccination uptake in adolescents. As mentioned previously, the aim of this study was to determine the correlational effect of provider-location type, race, and geographical region to identify trends related to racial disparities and regional provider health practices regarding HPV vaccine uptake among adolescents. I sought to create further research through identifying specific strategies related to reaching all racial groups and identifying regional-provider-locations, through possible outlining of provider HPV uptake practices in areas of higher uptake.

Purpose Statement

The purpose of this quantitative study was to determine if certain races and regions of the country have a significant effect on HPV vaccine uptake in adolescents. It was also important to determine specific racial and relational factors that may lead to a higher HPV vaccination rate, for further research. Factors may include educational barriers, socioeconomic factors, provider relationship, and/or outreach initiatives. I employed a quantitative research methodology using secondary data. I retrieved the data from the National Immunization Survey (NIS), which is a group of telephone surveys

sponsored by the Centers for Disease Control and Prevention's (CDC) National Center for Immunization and Respiratory Diseases (NCIRD; CDC, 2018).

Research Questions and Hypotheses

RQ1: What is the effect of race and region of the United States on HPV vaccine uptake in adolescents?

$H_0$1: There is no effect of race and region of the United States on HPV vaccine uptake in adolescents.

H_0a: There is a significant effect of race and region of the United States on HPV vaccine uptake in adolescents.

RQ2: What is the effect of race and provider-location type on HPV vaccine uptake in adolescents?

$H_0$1: There is no effect of race and provider-location type on HPV vaccine uptake in adolescents.

H_0a: There is a significant effect of race and provider-location type on HPV vaccine uptake in adolescents.

RQ3: What is the effect of region of the United States and provider-location type on HPV vaccine uptake in adolescents?

$H_0$1: There is no effect of region of the United States and provider-location type on HPV vaccine uptake in adolescents.

H_0a: There is a significant effect of region of the United States and provider-location type on HPV vaccine uptake in adolescents.

RQ4: Does race modify the effect of region of the United States on HPV vaccine uptake in adolescents?

$H_0$1: Race does not modify the effect of region of the United States on HPV vaccine uptake in adolescents.

H_0a: Race significantly modifies the effect of region of the United States on HPV vaccine uptake in adolescents.

Nature of the Study

This research examined how race, provider-location type, and region of the United States affects HPV vaccine uptake among adolescents. Quantitative methods are more objective than alternative approaches. This approach is consistent with understanding the research questions. To achieve the anticipated results, the NIS was used to address the research questions (CDC, 2018). Descriptive statistics were conducted to summarize the data. Additionally, a Pearson chi-square analysis was conducted to determine if there is a relationship between the variables, and a binary logistic regression analysis was conducted to determine the effect of race, provider-location type, and region of the United States on HPV vaccine uptake among adolescents.

Definition of Terms

The definition of key terms used throughout this study are shown below.

Human Papillomavirus (HPV): A small, double-stranded DNA virus that infects the epithelium. It is estimated that there are more than 120 HPV types (CDC, 2019). HPV is also the most common sexually transmitted infection in the United States (CDC, 2019). Epidemiologic studies showing a consistent association between HPV and cervical cancer were published in the 1990s (CDC, 2019).

HPV Vaccine: There are three HPV vaccines licensed in the United States (CDC, 2019). The FDA approved the quadrivalent HPV (HPV4) vaccine, also known as

Gardasil and manufactured by Merck, in 2006 (CDC, 2019). The bivalent HPV (HPV2) vaccine, also known as Cervarix, was approved by the FDA and manufactured by GlaxoSmithKline in October 2009 (CDC, 2019).

Race: The Census Bureau defines race as "a person's self-identification with one or more social groups" (Census.gov, 2017). An individual can report to be White, Black or African American, Asian, American Indian and Alaska Native, Native Hawaiian and Other Pacific Islander, or some other race (Census.gov, 2017)**.**

Provider-location type: For the purpose of this research study, provider-location type is defined as a place in which a vaccine is administered, which may include a hospital, health department, doctor's office, pharmacy, etc.

Geographical/Census Region of the United States: A region is an area of land that has common features. Regions of the United States are commonly grouped into five geographic locations: The Northeast, Southwest, West, Southeast, and Midwest (National Geographic, 2019).

Theoretical Framework

The Health Belief Model (HBM) developed by Hochman and Rosenstock was ideal for this study because it allows researchers to understand the health behavior change process. The HBM was developed to identify the attitudes of parents and providers toward HPV vaccination and what types of provider-locations, races, and geographical regions may affect those attitudes. Factors such as low risk perception may be a barrier to HPV vaccine uptake amongst adolescents; therefore, it was important to identify the effects of certain factors that may lead to understanding the barriers, benefits, self-efficacy and threats that affect HPV vaccine uptake amongst adolescents are of most

importance (Jones, Jensen, Scherr, & et al , 2015). The HBM implies that a specific health action will prevent or cure illness (LaMorte, 2018). There are several constructs that comprise the HBM: perceived susceptibility, a parent's perception of the risk of the HPV vaccine; perceived severity, the parent's feelings on the seriousness of their child contracting HPV; perceived benefits, the parent's perception of the effectiveness of vaccination; perceived barriers, a parent's feelings towards the obstacles to receiving the HPV vaccine; and cue to action, the need to trigger the parent to make the decision to vaccinate child against HPV.

Significance

Healthcare providers play an important role in educating patients and parents on the importance of HPV vaccination. Studies have consistently shown that non-existent or weak recommendations from health care providers are primary determinants of poor vaccine uptake (Ventola, 2016). As a result, it is important to develop interventions that target health care providers and their practices, including patient counseling, vaccine forecasting, and reminder systems (Ventola, 2016). In order to determine what providers are more effective in educating and administering HPV vaccination in adolescents, it was important to understand what type of provider-location types and what regional areas of the country were more successful in HPV uptake. It was also equally vital to determine the racial barriers associated with HPV vaccine. Race-specific factors can help or hinder vaccination rates in certain areas. It was also important to determine whether there was a relationship between certain provider-location types and race. The aim of this study was to open the path for further research in health promotion, identifying barriers, and determining why certain provider-location types are more successful than others are.

Implications for Social Change

Social change is about making a positive impact on society (Walden University, 2017). The potential social change impact of this study was the prevention of cancer. Strengthening the overall understanding of the impact of HPV prevention is important for fostering positive social change. Identifying specific racial barriers and provider-locations most affected while creating specified ways to increase HPV vaccination rates around the country will aid in preventing HPV-related cancer deaths of citizens of the United States, which in turn will aid in preventing HPV-related cancer deaths around the world. This study sought to create the ultimate positive impact on society through saving lives.

Assumptions

When discussing the assumptions of this study, it was important to factor in the characteristics of the data, as well as the sample size. The study's sample may not be representative of the population; however, it was my assumption that the sample size was a good representation of the population. I also assumed that individuals completing the survey were being truthful and that answers received at the time of the survey were verified for accuracy.

Scope and Delimitations

The scope of this study included parents of adolescent children across the United States. This group was targeted due to the age in which adolescents are recommended to receive the HPV vaccine, which is the ages of 11 and 12. The age group of this sample is 13 to17 which falls after the recommended age, to factor in adolescents who may have received the vaccination after the recommended age. I did not include younger age

groups because they would not apply to the recommended age for HPV vaccine acquisition, therefore causing issues with validity.

Limitations

The limitations of this study included the inability to conclusively attribute race, geographical region of the United States, and/or provider-location type to an increased uptake in HPV vaccination. An additional limitation of this study was that the sample was not representative of the entire population. It is important to understand this limitation as the NIS does not survey the entire population. Additional barriers may have been produced as a result of inaccurate reporting, which would reduce validity.

Summary

This chapter discussed the causality and etiology of HPV. This chapter also explored the importance of the HPV vaccine and the growing concern regarding the low uptake amongst adolescents. HPV can adversely affect so many lives, however, we are fortunate to have developed a vaccine that is available to adolescents. We are also fortunate to have a public health advance with the use of the HPV vaccine that can prevent HPV and ultimately varying types of cancers in all genders. HPV vaccine administration falls behind other recommended vaccines but has the potential to prevent frequent infection and save lives. Therefore, it was important to understand the factors and barriers that may affect the uptake in adolescents. This study was aimed at identifying the effects and significance of such factors.

Chapter 2: Literature Review

Introduction

HPV is the most common sexually transmitted infection in the United States and has the ability to cause frequent infection and several forms of cancer (Centers for Disease Control and Prevention, CDC, n.d.). HPV vaccination rates in the United States remain low compared to other recommended vaccines such as Tdap. There are several factors that contribute to the low uptake of HPV vaccination. The purpose of this literature review was to understand and expand on the existing knowledge surrounding the factors effecting HPV vaccine uptake in adolescents.

This literature review discusses the theoretical framework relevant to this study, the etiology of HPV, and the mode of prevention. I intended to identify racial and regional factors that influence HPV uptake in adolescents as revealed in previous studies. The literature review also looks into HPV, vaccination strategies, and physician recommendation. There was insufficient research that identified provider-location type and its effect, if any, on HPV uptake in adolescents in the United States. There was also no research found regarding the aforementioned factors cohesively having an effect on HPV uptake amongst adolescents. This literature review also details overall findings and trends to gain a better understanding of what previous research discovered.

Literature Search Strategy

My review of the literature identified scholarly articles published between 2015 and 2020. To conduct the literature review, I searched the Walden University Library along with the following online databases: ProQuest, MEDLINE, PubMed, EBSCOHost, SAGE Publications, and Google Scholar. The database search was conducted using a

Boolean search string composed of the following key terms: *HPV, human papillomavirus vaccine, HPV vaccine uptake AND adolescents AND barriers, HPV Vaccine uptake AND race AND adolescents, HPV vaccine uptake AND adolescents AND provider location type, HPV Vaccine uptake AND adolescents AND geographical region,* and *HPV vaccine uptake AND United States.* Various other articles were located using the references of related studies.

The literature screening process included reviewing the abstracts of each article to determine if it met the criteria for inclusion in this literature review. Articles were excluded based on the following factors: if they were published prior to 2015, if the study was conducted outside of the United States, and if the article was not relevant to HPV vaccination uptake. Articles that were reviewed in their entirety provided insight into the research that has been conducted surrounding the topic of this dissertation.

Theoretical Framework

The HBM was the ideal theoretical framework for this study. The HBM was developed to understand the process of health behavior (Rosenstock, 1974). The HBM was created from independent and applied public health service research problems between 1950-1960, and as practical problems were solved, the HBM evolved (Rosenstock, 1974). In the 1950s, patient compliance and physician-patient communication were not a consideration of the public health realm, and during this time, individuals often did not comply with disease prevention measures and test screenings for conditions such as cervical cancer (Rosenstock, 1974). The HBM was ultimately

developed to address these factors by explaining and targeting preventative behavior prior to the potential onset of disease (Rosenstock, 1974).

The HBM will aid in identifying the attitudes of parents and providers toward HPV vaccination as a preventative measure and will ultimately identify how the specified factors may affect the proposed and intended behavior change. The HBM will assist in addressing the importance of targeted audiences, provider-relationship, and rapport, and could indicate whether knowledge, accessibility, race, region, and provider-location lead to a higher uptake of HPV vaccine amongst adolescents. Table 1 depicts the constructs in relation to HPV vaccine uptake regarding this study.

Table 1

Health Belief Model Constructs

Theoretical framework (HBM) constructs	Definition	Application
Perceived susceptibility	A person's perception of the risk of acquiring a disease.	Parents' perception of adolescent child acquiring HPV, due to factors of race, geographical location, and provider-location type.
Perceived severity	A person's feelings on the seriousness of contracting a disease	Parents' feelings on the severity of their adolescent child contracting HPV, which may be affected by factors such as race, geographical location, and provider-location type.
Perceived benefits	A person's perception of the effectiveness of various actions available to reduce the threat of illness or disease	Factors that may affect the parent's perception of the effectiveness of the HPV vaccine to reduce the threat if infection.

Perceived barriers	A person's feelings on the obstacles to performing a recommended health action.	Factors contributing to the obstacles to acquiring HPV vaccination for their adolescent child.
Cues to action	Stimulus needed to trigger the decision-making process to accept a recommended health action.	Strategies to trigger the decision to acquire the HPV vaccine for adolescent child.
Self-efficacy	The level of a person's confidence in his or her ability to successfully perform a behavior.	Parents' confidence in their ability to successfully have their adolescent child vaccinated.

(Rosenstock, 1974).

Previously, the HBM had been used to predict a health behavior based on a person feelings, knowledge, beliefs, or attitudes. For instance, the HBM was used to investigate the effect of educational programs on nursing students' health beliefs and practices of breast self-examination (Kissal & Kartal, 2019). Other researchers have used it to explore the predictors of Haitian men's intention to screen for prostate cancer (Louis, 2019). It has been found that education has a positive influence on the frequency of breast self-examination, the HBM will aid in understanding how a person's knowledge can influence behavior change (Kissal & Kartal, 2019). It has also been found that culture can be a barrier to individual's decision to screen for prostate cancer (Louis, 2019).

The HBM provides a process of behavior change evolution. It begins with the belief or attitude, followed by education and knowledge, and finally by confidence and ability. It facilitated understanding of the attitudes towards HPV and how specific factors affected those attitudes, cohesively. Understanding how race, geographical location, and provider-location type affect a parent's choice to vaccinate was important. The

aforementioned assisted in identifying strategies and interventions that can be used to increase vaccination amongst the barriers and to identify a target population to reach this feat.

Review of Literature Related to Key Variables and Concepts

Human Papillomavirus Information

HPV are double-stranded DNA viruses that infect the basal, cutaneous, and mucosal epithelium. Of the more than 120 HPV types, 40 types infect the mucosal epithelium and have been found to correlate with cervical carcinoma (CDC, n.d.). There are over 13 cancerous high-risk HPV types, with 70% of cervical cancer being attributed to types 16 and 18, accounting (Ault, 2006). HPV infection incidence is high and typically asymptomatic, however the virus generally heals on its own, while some other individuals become persistently infected which increases the risk for cervical cancer development, with the most significant being the cervical intraepithelial neoplasia, or CIN (Ault, 2006). The CIN can range from low-grade CIN 1 to high-grade CIN 3; the higher the grade, the higher the risk of cancer (Ault, 2006). In low-grade lesions, HPV is in episomal form, while in high-grade lesions and cancer, the HPV DNA is typically integrated into the host-cell chromosome (Ault, 2006). Figure 1 provides more information on HPV infection.

The clinical manifestations of HPV infection include genital warts, recurrent respiratory papillomatosis, cervical cancer precursors, and various cancers including cervical, anal, vaginal, vulvar, penile, and oropharyngeal (CDC, n.d.).

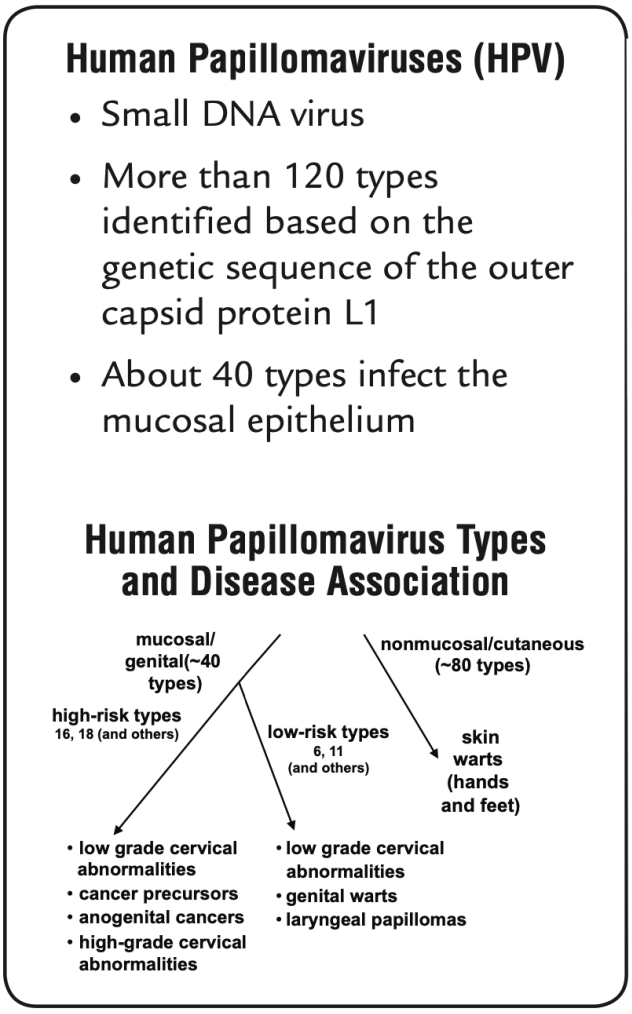

Figure 1. Human papillomavirus.

(Centers for Disease Control and Prevention, n.d.).

Human Papillomavirus Prevalence and Transmission

There are approximately 79 million people in the United States currently infected with HPV, with sexual activity being the major risk factor for infection (CDC, n.d.). HPV spreads by direct sexual contact, and it is believed that by age 50, 80% of women will contract HPV infection (Ault, 2006). Figure 2 shows the natural history of HPV infection.

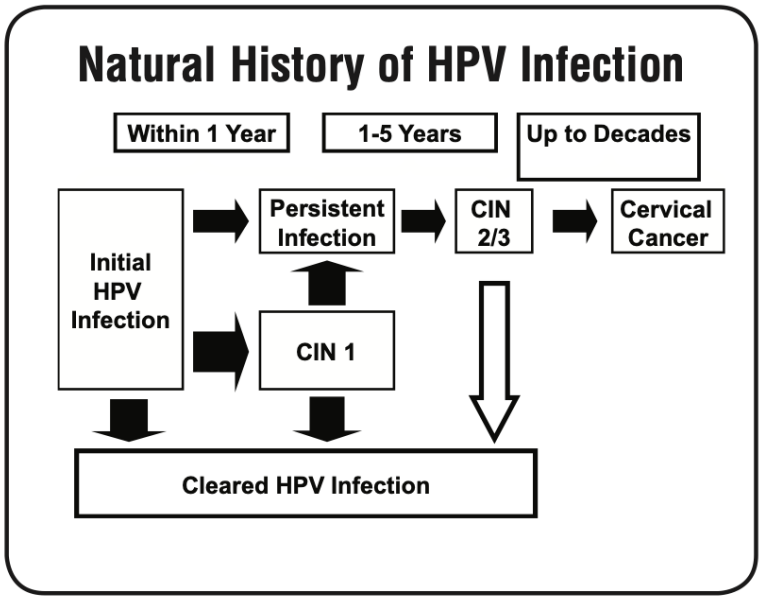

Figure 2: Natural history of HPV infection.

(Centers for Disease Control and Prevention, n.d.).

HPV Vaccination Information

Currently, there are three vaccines that prevent infection with disease-causing HPV types: quadrivalent vaccine Gardasil, nonavalent vaccine Gardasil 9, and bivalent vaccine Cervarix, all are licensed for use in the United States (Cancer.gov, 2019). Each of these vaccines prevent infection with the two high risk HPV types, 16 and 18. Gardasil prevents infection with HPV types 6 and 11, while Gardasil 9 prevents infection with the same four HPV types plus five additional cancer-causing types (31, 33, 45, 52, and 58) (Cancer.gov, 2019). Currently, Gardasil 9 is the only HPV vaccine available for use in the United States (Cancer.gov, 2019).

United States ACIP HPV Vaccination Recommendation

The Advisory Committee on Immunization Practices (ACIP) develops recommendations on vaccination to prevent and control vaccine preventable diseases in the United States. Once the ACIP formulates the recommendations the CDC director reviews the recommendations for approval, once approved the recommendations are published and adopted. (CDC, 2019). The ACIP recommends that HPV vaccination should be administered at the age of 11 or 12 years, however, vaccination can be started as early as age 9 years. HPV vaccination is recommended for all persons through age 26 years who were not adequately vaccinated earlier (CDC, 2019). The Healthy People 2020 target goal for adolescent HPV vaccination is 80% (National Vaccine Advisory Committee, 2016).

Studies on HPV Vaccine and Physician Recommendation

It has been proven across the literature that provider recommendations are one of the most important elements of HPV vaccine uptake amongst adolescents. Provider recommendations are not given consistently, the recommendations may not be timely, which increases missed opportunities, and are often not considered urgent, in regard to strong recommendations in receiving the vaccine prior to exposure to the infection (Sriram & Ranganathan, 2019). Researchers found that adolescents who are not recommended for vaccination by the family physician were 0.43 times less likely to get HPV vaccination compared to adolescents that were recommended to get the vaccination by the provider $p = 0.000$, OR 0.57, 95% CI [0.49, 0.65] (Sriram & Ranganathan, 2019).

Shawhan and Ruppe (2019), mentioned that a firm and consistent recommendation in favor of vaccinating for HPV, should be completed at every

opportunity to vaccinate and should be offered to patients just as other recommended vaccines (Shawhan & Ruppe, 2019). According to the 2015 study of National Immunization Survey–Teen national survey data, a significant predictor of HPV vaccine uptake was attributed to provider recommendation, even with patients and/or parents having common knowledge of the vaccine (Shawhan & Ruppe, 2019). Valentino and Poronsky (2016), mentioned that providers often fail to recommend HPV vaccination for adolescents, and typically provide weaker recommendations for HPV vaccination compared with other vaccinations recommended for adolescents; ultimately diminishing its importance (Valentino, & Poronsky, 2016).

According to a study, provider recommendations among females were highest among non-Hispanic whites, while provider recommendations among males were lowest among non-Hispanic whites (Burdette et al, 2017). Hanson et al. (2019) mentioned that at follow-up, 65% of survey respondents reported receiving an HPV vaccine recommendation from a healthcare provider, 56% of respondents reported discussing HPV vaccine with their parents, and 55% had initiated the HPV vaccine series (Hanson, McLean, Belongia, & et al., 2019). Loke et al. (2017), mentioned that within the 42 articles of conducted research, one-third reported that a major facilitator of HPV vaccination among adolescents was the healthcare provider or physician recommendation (Loke, & et al, 2017). Health care providers were considered to be the most trusted source of health information for parents and was a major determining factor for the parents to agree to have their child vaccinated against HPV (Loke, & et al, 2017).

Studies on HPV Vaccine and Provider-Location Type

Garbutt et al. (2018) indicated that accurate characterization of the facilitators and barriers to implementation of HPV vaccine recommendations in the primary care setting has the ability to inform effective implementation strategies (Garbutt, Dodd, Walling & et al, 2018). A Consolidated Framework for Implementation Research (CFIR) was used to assess factors the aid in HPV vaccine influence in 10 primary care practices (Garbutt, Dodd, Walling & et al, 2018). The results showed strongly distinguishing constructs, of which included knowledge and beliefs, self-efficacy, readiness for change, perception, and the process to deliver the vaccine (Garbutt, Dodd, Walling, & et al, 2018). These constructs show the various significant barriers to HPV vaccination at the primary provider level. There are other provider types that may have the same barriers, and possibly more. This shows that addressing the HPV vaccine issue will be a multi-step and multi-prong approach, but first it is important to understand what providers are more or less successful to identify the strategies that can be adopted to effectively combat the low uptake of HPV vaccination amongst adolescents.

Katz et al. (2016) indicated that further research should look into strategies are needed to support providers, including vaccine promotion and delivery while addressing HPV vaccination concerns for parents (Katz, Bogart, Fu, & et al, 2016). Additional areas of research include, collaboration at the practice level through standardization of reminder systems for better efficiency (Garbutt, Dodd, Walling & et al, 2018). Provider-location has the ability to affect HPV vaccination uptake in adolescents. A study was conducted that incorporated an intervention bundle to include, empowerment of nurses, no cost vaccination medical records review, and collaboration (Deshmukh, Oliveira,

Griggs & et al, 2018). Overall, the implementation of this strategy led to a decrease in missed opportunities at an OB/GYN clinic and increased the initiation of HPV vaccination, this increase was significant amongst minority Hispanic, publicly insured and uninsured women (Deshmukh, Oliveira, Griggs & et al, 2018). This article provided a great deal of information; even though this was not a study targeted at adolescents, the strategy could still work amongst minority groups and amongst different provider-location types. It is important to identify what works, and how to effectively identify the strategies that have worked according to previous research. This study provided more details into interventions that can contribute to effectiveness and an increase in HPV vaccination uptake amongst adolescents (Deshmukh, Oliveira, Griggs & et al, 2018).

Studies on HPV Vaccination Strategies

HPV vaccine strategies can provide insight into increasing HPV vaccination amongst adolescent while considering a variety of factors. Institutional and policy factors contribute positively to increasing uptake of HPV vaccine, school-based policies are also effective in achieving higher vaccination rates, however, this can be very complex with a vaccine such as HPV because it is not communicable in a school setting (Head, Biederman, Sturm, & Zimet, 2018). Vaccine policies also play a key role in increasing the uptake of HPV vaccination, due to efficacy of a 2 dose series, the reduction in the number of doses of HPV from 3 doses to 2 doses prior to age 15, may contribute to an increase in uptake as well as, completion of the series. Age-based policies may also increase the uptake of HPV amongst adolescents, the suggestion of moving the age of vaccination to an earlier age, may disassociate the vaccine with the initiation of sex (Head, Biederman, Sturm, & Zimet, 2018). An additional strategy is the countering of

anti-HPV vaccine rhetoric, HPV vaccine controversies are plentiful, with the belief that the vaccination will translate to increased sexual activity, and negative beliefs surrounding the vaccination (Head, Biederman, Sturm, & Zimet, 2018). Technology is also a great resource for increasing HPV vaccination, eHealth can assist in addressing HPV vaccination in a clinical setting, for example reminders, and forecasting of vaccination.

Identifying which providers are using technological platforms such as eHealth can assist in determining the providers with an increased level of HPV vaccination amongst adolescents (Head, Biederman, Sturm, & Zimet, 2018). Lastly, community-based interventions have the ability to increase vaccination among adolescents, effective communication can change the narrative and negative beliefs associated with the HPV vaccine; community-based interventions can also target a specific population in a specific area, amongst different providers, ultimately increasing HPV vaccination rates amongst adolescents (Head, Biederman, Sturm, & Zimet, 2018). Overall, it is important to identify strategies that will influence and educate on HPV vaccination. Establishing public policy, taking advantage of eHealth technologies, and creating effective communication, can assist in increasing HPV vaccine uptake amongst adolescents. Further research is needed to determine effective strategies that can lead to increased HPV vaccination, of which a multifaceted and multipronged approach seems to be ideal and would have the ability to address several of the barriers to increase HPV vaccine uptake through education, and changed behavior (Katz, Bogart, Fu, & et al, 2016).

Studies on HPV Vaccination and Race

There are racial differences as it pertains to HPV vaccination amongst adolescents. There are variations among different races and the initiation of the HPV vaccine amongst adolescents. The study showed Hispanic adults were 1.47 times more likely to get vaccinated compared to non-Hispanic adolescents $p = 0.000$, OR 1.47, 95% CI [1.24, 1.74] (Sriram & Ranganathan, 2019). A study also found that Hispanic female adolescents initiated the HPV vaccine at a higher rate (48%), while African American adolescents had a lower rate of HPV vaccine initiation (40%) (Burdette, Webb, Hill & et al, 2017). Additionally, minority adolescent males had a higher rate of HPV vaccine initiation (12%) while non-Hispanic whites had lower HPV vaccination initiation (24%) (Burdette, Webb, Hill & et al, 2017). An investigation into collaborative communication and race was identified, it was found that this type of communication was less common for Hispanic than for non-Hispanic white girls, $p<.05$ (Moss, Gilkey, Rimer, & et al, 2016). In regard to the attitudes toward HPV vaccination, Hispanic (versus White) parents placed greater importance on HPV vaccination to benefit their son's future sex partners ($b = .38$). Black ($b = .64$) and Hispanic ($b = .67$; versus White) males reported higher individualistic vaccination importance (Polonnijo, Carpiano, Reiter, & Brewer, 2016). Henry, et al mentioned that HPV initiation was higher among girls predominately Hispanic areas, 69.0% vs. 49.9%; AOR, 1.64; 95% CI [1.43–1.87] or non-Hispanic mixed race 60.4% vs. 49.9%; AOR, 1.30, 95% CI [1.17–1.44] compared with predominately non-Hispanic white areas (Henry, Stroup, Warner, & Kepka, 2016). Further research looks at targeting those considered to be high risk for HPV-related cancers within underserved populations (Head, Biederman, Sturm, & Zimet, 2018).

Studies on HPV Vaccination and Geographical Location

Regional disparities and variations in the United States are a significant barrier and can have an effect on HPV vaccination uptake amongst adolescents. Additionally, adolescent girls residing in the South were less likely to initiate the HPV vaccine then adolescent girls residing in the Northeast. As a whole, the study showed that adolescents from the northeastern regions of the United States were 1.62 times more likely to get vaccinated then adolescents in southern regions of the United States, $p = 0.000$, OR 1.62, 95% CI [1.38, 1.90] (Sriram & Ranganathan, 2019). Lastly, collaborative communication and geographical location were investigated to determine an effect. A study showed a statistically significant effect when comparing the Northeast and the Southern geographical location in regards to collaborative communication, it was found that parents were more likely to report collaborative communication if they did not reside in the South, OR 1.38, 95% CI [1.06, 1.81] (Moss, Gilkey, Rimer, & et al, 2016). Henry, & et al mentioned that there was a significant difference in HPV initiation among girls in high poverty communities compared with girls in low poverty communities 61.1% vs. 52.4%, AOR, 1.18; 95% CI [1.04–1.33] (Henry, Stroup, Warner, & Kepka, 2016).

Conclusion

Previous research has found a wealth of information regarding barriers to vaccination. Provider recommendation is positively correlated with parent's willingness to increase HPV vaccination approval. Race and geographical location was also found to have a significant effect on HPV vaccination uptake amongst adolescents in the United States. Further research is needed to identify the strategies and areas that are beneficial in

HPV uptake. In order to complete the aforementioned, it was important to identify the areas that show significance.

Identifying provider types that are more successful in vaccinating against HPV in geographical locations and races that are thriving will provide the most valuable information. This study endeavored to contribute to the field of public health by identifying the provider-types, regions and races with the most success in HPV vaccination, so that we can identify a target audience to learn from and reciprocate the educate to others within the field. This will enable a more effective vaccination strategy and intervention, and an increase in vaccination across all, races, geographical locations, and provider types. This will also result in the prevention of cancer, and the saving of lives.

In Chapter 3, I will discuss my research design, planned methodology, population, sampling and sampling procedures, data collection, and threats to validity.

Chapter 3: Research Method

Introduction

In Chapters 1 and 2, details surrounding HPV vaccination, the vaccination recommendations for HPV, and the purpose and rationale for this research study were discussed. As mentioned previously, the purpose of this quantitative study was to determine if certain races and provider-locations in specific regions of the United States have better HPV vaccine uptake in adolescents, taking into account the importance of determining specific racial and relational factors that may lead to a higher HPV vaccination rate for possible further research on increased HPV uptake strategies. Determining these factors can identify what strategies have the potential to aid in an increase in HPV vaccination uptake, which will ultimately lead to addressing barriers that may exist and a decrease in HPV infection. In Chapter 2, the literature review discussed the known barriers of HPV vaccination and the possible implications for the low vaccination rate; additionally, I discussed the gap in literature and detailed the current literature on the topic. In this chapter, I discuss research design and the rationale for using a quantitative methodology. I also detail the target population, data collection and data analysis procedures, instrumentation, and threats to validity.

Research Design and Rationale

The overall purpose of this study was to examine the factors of race, provider-location type, and region of the United States, and whether there is a significant effect on HPV vaccine uptake among adolescents. I used a cross-sectional research design, as the results of this study provided a glimpse into the probable outcome, and the characteristics

and factors associated with it at a specific point in time (Sacred Heart University Library, n.d.).

The results acquired from this study can be used to inform public health and health promotion strategies to increase HPV vaccination uptake amongst adolescents. In this study, I used a quantitative methodology and conducted a binary logistic regression analysis to determine the effect of race, provider-location type, and region of the United States, on HPV vaccine uptake among adolescents. This type of analysis will help to determine statistical significance amongst these factors in a cohesive manner. Secondary data from the National Immunization Survey (NIS) was used to address the research questions. From this survey, I retrieved the HPV data for adolescents, as well as data on the targeted demographics of said adolescents. There were no time and resource constraints with this design choice.

Methodology

Population

The target population for this study consisted of adolescents between the ages of 13 and 17 living in the United States at the time of the survey in year, 2018. The target population also consisted of adolescents across the United States in this age group, who have received one or more doses of HPV vaccination. The NIS data has a sample size of approximately 38,706. According to CDC, sample estimates and actual population values may differ; however, the difference is quantified through the 95% confidence interval and therefore still representative of the adolescent population in the United States (Centers for Disease Control and Prevention, 2015).

Data Collection

The secondary data source for this study was the NIS. The NIS conducted the first survey in April 1994 (Centers for Disease Control and Prevention, 2018). NIS data is retrieved via telephone interviews with parents or guardians in all 50 states, the District of Columbia, and some U.S. territories (Centers for Disease Control and Prevention, 2018). The process of selection begins with cell phone numbers being randomly selected and called to enroll age-eligible teens from the household (Centers for Disease Control and Prevention, 2018). Names of participants' children's vaccination providers are requested along with permission to contact them; this is needed in order to confirm the vaccination information provided by the parent (Centers for Disease Control and Prevention, 2018). Once permission is obtained from the parent, a questionnaire is mailed to each child's vaccination provider(s) to collect vaccine information regarding the number of doses and dates of vaccine administration (Centers for Disease Control and Prevention, 2018). Inclusion criteria for the NIS applied to parents of students between the ages of 13-17 who participated in the survey. Exclusion criteria was applied to parents of students who did not participate in the study.

The NIS survey was selected for this study because it is inclusive of the target population and adolescent vaccines, specifically HPV vaccination. Through the use of the NIS I obtained current, population-based, state estimates of HPV vaccination coverage (Centers for Disease Control and Prevention, 2018). The NIS is conducted by the Centers for Disease Control and Prevention, which shows the reliability and validity of this data source. The NIS data is publicly available on the CDC's website at

https://www.cdc.gov/vaccines/imz-managers/nis/data-tables.html; no formal permission was required to use or access this data.

Sampling Procedures

The NIS sample is representative of the adolescent population in the United States. As mentioned previously, the sample size for the NIS is approximately 38,706. Determining the appropriate sample size was important to ensure a valid sample and statistical significance. Using the Raosoft calculator the recommended sample size produced is 381, with a margin of error of 5%, a confidence level of 95%, a population size of 38,706 and a response rate of 50% (Raosoft, 2004).

Instruments

As mentioned previously, the instrument that was used for this study is the 2018 NIS. The survey is administered to parents of adolescents across the United States, in reference to several vaccines including HPV vaccination; approximately four questions will be analyzed.

Operationalization

The effects of the following factors were analyzed:

Race, which is an independent variable, is defined as one of the following: White, Black or African American, American Indian, Alaska Native, Asian, Native Hawaiian or other Pacific Islander. Provider-location type, which is an independent variable that is defined as the location of the vaccine provider. Region of the United States, which is also an independent variable in this study and is defined as West, Midwest, Northeast, and South.

The aforementioned variables were used to determine the effect on the dependent variable of HPV vaccination rates amongst adolescents, which includes 13-17-year old's.

The survey questions used provided the demographic information, such as race, at which provider-location the HPV vaccination was received, and the state in which the adolescent received the HPV vaccine. Questions from the NIS that were used for this study can be found in Appendix A. Variables and questions used form the NIS are listed in Table 2 below.

Table 2

NIS Teen Data Variables and Questions

Variable Name	**Variable type**	**Statistical test**	**Question**
TIS_BHPV2	Dependent variable	Binary regression	Has [TEEN] ever received HPV shots?
TIS_BHPV_LOCATION	Independent variable	Binary regression	Please tell me all the types of places where [TEEN] has received an HPV shot. READ IF NECESSARY: This question is referring to the location of the vaccine provider, not to the location on the body where the shot was given.
TIS_C4	Independent variable	Binary regression	Now, I am going to read a list of categories. Please choose one or more of the following categories to describe [TEEN]'s race. Is [TEEN] White, Black or African American, American Indian,

			Alaska Native, Asian, Native Hawaiian or other Pacific Islander?
TIS_C19	Independent variable	Binary regression	In what city, county and state do you live?

Data Analysis Plan

The Statistical Package for the Social Sciences (SPSS) was used to conduct the data analysis. Questions that were not relevant were removed from the data sample; coding identifiers were available.

Research Questions

A qualitative research methodology was considered however, it would be very difficult to capture attitudes and beliefs associated with HPV rates amongst adolescents across the country. Therefore, the quantitative methodology was the preferred methodology for this study. As mentioned previously, using a quantitative research approach, I looked to address the following research questions:

Research Question 1: What is the effect of race and region of the United States, on HPV vaccine uptake in adolescents?

The dependent variable in this research question is HPV uptake in adolescents, while the independent variables are race and region of the United States. The statistical

test that will be used for this research question is a binary logistic regression analysis to determine if there is an effect.

Research Question 2: What is the effect of race and provider-location type on HPV vaccine uptake in adolescents?

The dependent variable in this research question is HPV vaccine uptake in adolescents, the independent variables are race and provider-location type. The statistical test that will be used for this research question is a binary logistic regression analysis to determine if there is an effect.

Research Question 3: What is the effect of region of the United States and provider-location type, on HPV vaccine uptake in adolescents?

The dependent variable in this research question is HPV vaccine uptake in adolescents, and the independent variables are region of the United States and provider-location type. The statistical test that will be used for this research question is a binary logistic analysis to determine if there is an effect.

Research Question 4: Does race modify the effect of region of the United States, on HPV vaccine uptake in adolescents?

The dependent variable in this research question is HPV vaccine uptake in adolescents, and the independent variables are race and region of the United States. The statistical test that was used for this research question is a binary logistic regression analysis which aimed to determine am estimate of an effect of region of the United States while adjusting for race in HPV vaccine uptake in adolescents.

Research Hypotheses

The hypotheses for this study consisted of the following;

$H_0$1: There is no effect of race and region of the United States, on HPV vaccine uptake in adolescents.

H_0a: There is a significant effect of race and region of the United States, on HPV vaccine uptake in adolescents.

$H_0$1: There is no effect of race and provider-location type, on HPV vaccine uptake in adolescents.

H_0a: There is a significant effect of race and provider-location type, on HPV vaccine uptake in adolescents.

$H_0$1: There is no effect of region of the United States and provider-location type, on HPV vaccine uptake in adolescents.

H_0a: There is a significant effect of region of the United States and provider-location type, on HPV vaccine uptake in adolescents.

$H_0$1: Race does not modify the effect of region of the United States, on HPV vaccine uptake in adolescents.

H_0a: Race significantly modifies the effect of region of the United States, on HPV vaccine uptake in adolescents.

In order to address the aforementioned research questions, a combination of various statistical approaches were used. Descriptive statistics, and p-value was used to determine association, a binary logistic regression was used to determine if there is a statistically significant effect and a Pearson chi-square test was used to determine whether a relationship between the variables existed. As mentioned previously, a binary logistic regression was used to predict the value of a variable, in this case the dependent variable, which is HPV vaccination amongst adolescents, based on the value of two or

more other variables, in this case, the independent variables, which are race, provider-location type and region of the United States (Laerd Statistics, 2018). The significance level was set at 0.05 with a 95% confidence interval. Covariates were not included in this data analysis.

Threats to Validity

A discussion of both internal and external validity was very important to assess the validity of the results presented in a study. Threats to external validity are any factors within a study that reduce the generalizability of the results (Laerd Statistics, 2012a). The threats to internal validity are factors that can affect the outcome (Laerd Statistics, 2012b). Quantitative research designs can make outcomes and generalizations from the sample being studied. The outcomes and generalizations include the population in which the sample is drawn, and/or across populations (Laerd Statistics, 2012a).

Selection biases is an example of threats to internal and external validity. The NIS sample used can have selection/volunteer bias as the individuals sampled may be from parents who only use cell phones, and not parents who have landlines. The aforementioned example can be a threat to validity as this group of parents may not be random enough to be representative of the population. An additional, example of selection bias is the age of the sample may be disproportionate, the response rate for older parents with adolescent children may be different from younger parents with adolescent children, causing a threat to validity as this may cause the result to be invalidated as not representative of the population.

The threats to construct validity were also important to address as this aspect focused on the generalizability from my study and whether it actually measured HPV uptake amongst adolescents (Trochim, 2020).

Ethical Procedures

Ethical considerations were made with the use of secondary data, as this data was publicly available, and permissions are not required. In regard to confidentiality, the data was aggregated, and no identifying information was available. The data file was stored in SPSS on my computer until the approval of dissertation, IRB approval of storage policy was confirmed. Participation in the survey was voluntary and participants were made aware of their choice, verbal consent was given.

Summary

In Chapter 3, I detailed the research design and rationale of this study, along with the methodology to include the target population. I also detailed the sampling and sampling procedures, the dataset to be used, instrumentation and operationalization of the data, threats to validity and ethical procedures. In Chapter 4, I will discuss the data analysis and detail the results of the analyses.

Chapter 4: Results

Introduction

The purpose of this quantitative study was to determine if there is an effect of race, provider-location type, and region on HPV vaccine uptake amongst adolescents. The predictor variables included race, provider-location type, and geographical/census region, while the dependent variable is HPV uptake amongst adolescents. This study examined whether there is a significant effect between the predictor variables and the dependent variable. The results determined areas where HPV vaccination in adolescence is increasing and areas in which HPV vaccination is lagging. Data for this study were acquired from the 2018 NIS-Teen survey to answer my research questions; the data were analyzed using SPSS version 25. In this chapter, I discuss the data collection methods, detail the research questions and hypotheses, discuss the statistical assumptions, and relay the results of the study.

Discrepancies

I intended to use a multiple regression analysis to answer my research questions. However, it was determined that the best fit for this study would be the use of a binary logistic regression, as my dependent variable is dichotomous. Additionally, in reference to the provider-location type variable, there were a total of 20,139 (52%) missing variables, however, the power analysis deemed the amount of responses received were sufficient for this study.

Dependent Variable

The dependent variable in this study included receipt of HPV vaccination. This variable was ascertained by asking respondents if their adolescent child had received an HPV vaccine. The dependent variable was recoded in SPSS as ‘No HPV shot’ and ‘Yes HPV shot.’

Independent Variables

The independent variables included race, which used the categories of White only, Black only, and Other/multiple races. Another independent variable was geographical/census region, which used the categories of Northeast, Midwest, South and West. The independent variable of provider-location type used the categories of all public facilities, all private facilities, all hospital facilities, all STD/School/Teen clinic, mixed, unknown, and missing.

Research Questions and Hypotheses

The research questions and hypotheses for this study included the following:

RQ1: What is effect of race and region of the United States, on HPV vaccine uptake in adolescents?

$H_0$1: There is no statistically significant effect of race and region of the United States, on HPV vaccine uptake in adolescents.

H_0a: There is a statistically significant effect between race and region of the United States, on HPV vaccine uptake in adolescents.

RQ2: What is the effect of race and provider-location type on HPV vaccine uptake in adolescents?

$H_0$2: There is no statistically significant effect of race and provider-location type, on HPV vaccine uptake in adolescents.

H_0a: There is a statistically significant effect of race and provider-location type, on HPV vaccine uptake in adolescents.

RQ3: What is the effect of region of the United States and provider-location type on HPV vaccine uptake in adolescents?

$H_0$3: There is no statistically significant effect of region of the United States and provider-location type on HPV vaccine uptake in adolescents.

H_0a: There is a statistically significant effect of region of the United States and provider-location type on HPV vaccine uptake in adolescents.

RQ4: Does race modify the relationship of region of the United States on HPV vaccine uptake in adolescents?

$H_0$4: Race does not modify the relationship of region of the United States on HPV vaccine uptake in adolescents.

H_0a: Race significantly modifies the relationship of region of the United States on HPV vaccine uptake in adolescents.

Data Collection

The secondary data source for this study was the 2018 NIS. The NIS survey was selected for this study because it is inclusive of the target population and adolescent vaccines, specifically HPV vaccination. Through the usage of the NIS, I obtained current, population-based state estimates of HPV vaccination coverage (Centers for Disease Control and Prevention, 2018). Data from the NIS is retrieved through telephone interviews with parents or guardians in all 50 states, the District of Columbia, and some U.S. territories (CDC, 2018). The cell phone numbers are randomly selected and the parents and guardians of eligible children are asked for the names of their children's vaccination providers and permission to follow-up with them to verify information provided. Once the survey is completed, a questionnaire is mailed to each child's vaccination provider(s) to collect the information on vaccination type, dose number, dates of administration, and other additional administrative data about the health care facility

(CDC, 2018). The NIS is conducted by the Centers for Disease Control and Prevention, which shows the reliability and validity of this data source.

Results

This section details descriptive statistics, results of the chi-square test, and results of the binary logistic regression analyses.

Descriptive Statistics

A summary of the descriptive statistics can be found in Tables 3 through 9. The participants' age range is 13 to 17 years and the sample size is n = 38,706. The survey's respondents were primarily of White race adolescents, of which accounted for 29,531 (76.3%) of the study population; Black adolescents accounted for 3,975 (10.3%), and other/multiple race adolescents accounted for 5,200 (13.4%) of the study population. Of the census regions, 7,096 (18.3%) of respondents were from the Northeast region, 8,194 (21.2%) were from the Midwest region, 15,382 (39.7%) were from the South, and 8,034 (20.8%) of the study population were from the West. Amongst the provider-location types, 2,399 (6.2%) reported All Public, 2,012 (5.2%) reported All Hospital, 8,080 (20.9%) reported All Private, 490 (1.3%) reported All STD/Teen/School, 3,330 (8.5%) reported mixed, 2,286 (5.9%) reported unknown, and 20,139 (52.0%) were missing. Table 6 shows HPV uptake amongst adolescents responses received from survey responders. Of the survey responders, 14,084 (40.3%) reported No HPV shot and 20,896 (59.7%) responded Yes HPV shot. This sample size is appropriate and proportionate to the larger population, as the Raosoft calculator recommended a sample size of 381 and a population size of 38,706.

Table 7 shows the crosstabulation of race and HPV vaccination uptake. The results show that Black race adolescents (61.8%) were more likely than White race adolescents (59.4%) and

other/multiple race adolescents (60.3%) to receive an HPV vaccine. Table 8 shows the crosstabulation of census region. The results show that adolescents living in the Northeast region (66.1%) were more likely than adolescents in the South (57.7%), Midwest (60.7%), and West (57.1%) to receive an HPV vaccination. Table 9 shows the crosstabulation of provider-location type, and the results show that adolescents seeking care at hospitals (70.3%), and private facilities (66.4%) were more likely than public (59.4%), STD/School/Teen clinic (59.1%), and mixed facilities (65.8%) to receive an HPV vaccine.

Table 3

Race

Variable	*N*	Valid %	Cumulative %
Race			
White only	29,531	76.3	76.3
Black only	3,975	10.3	86.6
Other/multiple	5,200	13.4	100
Total	38,706	100	

Table 4

Region

Variable	*N*	Valid %	Cumulative %
Census region			
Northeast	7096	18.3	18.3
Midwest	8194	21.2	39.5
South	15382	39.7	79.2
West	8034	20.8	100
Total	38,706	100	

Table 5

Provider-Location Type

Variable	*N*	Percent	Valid %	Cumulative %

Provider location type				
All public facilities	2399	6.2	12.9	12.9
All hospital facilities	2012	5.2	10.8	23.8
All private facilities	8080	20.9	43.5	67.3
All STD/school /teen clinics	490	1.3	2.6	69.9
Mixed	3300	8.5	17.8	87.7
Unknown	2286	5.9	12.3	100
Missing	20139	52.0		
Total	38,706	100	100	

Table 6

HPV Vaccination Uptake

	Frequency	%	Valid %	Cumulative %
No HPV Shot	14084	36.4	40.3	40.3
Yes HPV Shot	20896	54.0	59.7	100.0
Total	34980	90.4	100	

Table 7

Crosstabulation of Race and HPV Vaccination Uptake

Variable	Category	HPV vaccine uptake		Total
		No HPV shot	Yes HPV shot	
Race	White only	10931	15976	26907
	% within race	40.6%	59.4%	100%
	% within HPV uptake	77.6%	76.5%	76.9%
	% of total	31.2%	45.7%	76.9%

	Black only	1345	2175	3520
	% within race	38.2%	61.8%	100%
	% within HPV uptake	9.5%	10.4%	10.1%
	% of total	3.8%	6.2%	10.1%
	other + multiple	1808	2745	4553
	% within race	39.7%	60.3%	100%
	% within HPV uptake	12.8%	13.1%	13.0%
	% of total	5.2%	7.8%	13.0%
	Total	14084	20896	34980
	% within race	40.3%	59.7%	100%
	% with HPV uptake	100%	100%	100%
	% of total	40.3%	59.7%	100%

Table 8

Crosstabulation of Region and HPV Vaccination Uptake

Variable	Category	HPV vaccine uptake		Total
		No HPV shot	Yes HPV shot	
Region	Northeast	2164	4214	6378
	% within region	33.9%	66.1%	100%
	% within HPV Uptake	15.4%	20.2%	18.2%
	% of Total	6.2%	12.0%	18.2%
	Midwest	2952	4550	7502
	% within region	39.3%	60.7%	100%
	% within HPV Uptake	21.0%	21.8%	21.4%
	% of Total	8.4%	13.0%	21.4%
	South	5869	8013	13882
	% within region	42.3%	57.7%	100%
	% within HPV Uptake	41.7%	38.3%	39.7%
	% of Total	16.8%	22.9%	39.7%
	West	3099	4119	7218
	% within region	42.9%	57.1%	100%
	% within HPV Uptake	22.0%	19.7%	20.6%
	% of Total	8.9%	11.8%	20.6%
Total		14084	20896	34980
	% within region	40.3%	59.7%	100%
	% within HPV Uptake	100%	100%	100%

	% of Total	40.3%	59.7%	100%

Table 9

Crosstabulation of Provider-Location Type and HPV Vaccination Uptake

Variable	Category	HPV Vaccine Uptake		Total
		No HPV shot	Yes HPV shot	
Provider Location	All Public Facilities	847	1241	2088
	% within Provider Location	40.6%	59.4%	100%
	% within HPV Uptake	14.4%	11.1%	12.3%
	% of Total	5.0%	7.3%	12.3%
	All Hospital Facilities	558	1320	1878
	% within Provider Location	29.7%	70.3%	100%
	% within HPV Uptake	9.5%	11.8%	11.0%
	% of Total	3.3%	7.7%	11.0%
	All Private Facilities	2503	4939	7442
	% within Provider Location	33.6%	66.4%	100%
	% within HPV Uptake	42.6%	44.3%	43.7%
	% of Total	14.7%	29.0%	43.7%
	All STD/School/ Teen Clinics	179	259	438
	% within Provider Location	40.9%	59.1%	100%
	% within HPV Uptake	3.0%	2.3%	2.6%
	% of Total	1.1%	1.5%	2.6%
	Mixed	1055	2028	3083
	% within Provider Location	34.2%	65.8%	100%
	% within HPV Uptake	17.9%	18.2%	18.1%
	% of Total	6.2%	11.9%	18.1%
	Unknown	738	1373	2111
	% within Provider Location	35.0%	65.0%	100%

	% within HPV Uptake	12.6%	12.3%	12.4%
	% of Total	4.3%	8.1%	12.4%
		5880	11160	17040
Total	% within Provider Location	34.5%	65.5%	100%
	% within HPV Uptake	100%	100%	100%
	% of Total	34.5%	65.5%	100%

Statistical Assumptions: Pearson Chi-Square Test

Statistical assumptions should be met when conducting a chi-square test. The first assumption is that two variables should be measured at an ordinal or nominal level, this assumption was met in this study as the independent variables of race, region, and provider-location type are each, categorical (Laerd Statistics, 2018). The next assumption is that the variables should consist of two or more categorical, independent groups, this assumption was met in this study as race has three independent groups, census region has four independent groups, and provider-location type has six independent groups (Laerd Statistics, 2018).

Statistical Assumptions: Binary Logistic Regression

Statistical assumptions are to be met when conducting the binary logistic regression. The first assumption indicated that the dependent variable should be measured on a dichotomous scale, this was met as the dependent variable HPV vaccine received is a dichotomous variable with answers of either yes or no. The second assumption indicated that there are one or more independent variables that are either continuous or categorical, this assumption has been met as the independent variables of race, census region, and provider-location type are each considered categorical (Laerd Statistics, 2018). The third assumption indicated there should be independence of observations and the dependent variable should have mutually exclusive and exhaustive categories, this assumption was met as the variables whether dependent or

independent were mutually exclusive (Laerd Statistics, 2018). The fourth assumption indicated that there needs to be a linear relationship between any continuous variable, of which is not applicable in this study as the independent variables were categorical (Laerd Statistics, 2018). It was verified that the binary logistic regression assumptions have been met.

Binary Logistic Regression Analysis

A binary logistic regression analysis was conducted to examine the effect of race, and region on HPV vaccine uptake amongst adolescents; race, and provider-location type on HPV vaccine uptake amongst adolescents; region and provider-location type on HPV vaccine uptake amongst adolescents and the interaction of race and region on HPV vaccine uptake in adolescents. The binary logistic regression was selected for this study because I will be using 3 independent variables and a dichotomous dependent variable. Table 10 shows how many cases were included in the analyses, how many cases were excluded or missing and how many cases were in total. There were a total of 38,706 total cases, 34,980 were included in the analysis and 3,726 were missing. Additionally, the results of the chi-square analysis showed statistical significance. The model, containing each of the predictor variables, resulted in $X^2(11, n = 38{,}706) = 165.4$, $p < .001$. All predictors provided a unique statistically significant contribution to the model (see Table 11).

Table 10

Case Summary

Selected Cases		*N*	%
	Included in Analysis	34,980	90.4
	Missing Cases	3,726	9.6
	Total	38,706	100
Unselected Cases		0	0

Table 11

Chi-square Test

	Chi-square	*Df*	*p*
Model	165.399	11	.000

Statistical Analysis Findings

Research Question 1 (RQ1): What is effect of race and region of the United States, on HPV vaccine uptake in adolescents?

To address RQ1, a binary logistic regression and chi-square test was conducted to determine whether there was an effect of race and region of the United States, on HPV vaccine uptake amongst adolescents and whether there was a relationship between the variables. The chi-square test containing the race and census region predictor variables, was significant overall, $X^2(5, n = 38{,}706) = 164.951$, $p < .000$. Although, the model was significant, Black race (p=.113), other/multi race (p=.282), and the Western region (p=.509), did not have a significant effect on HPV uptake amongst adolescents. As shown in Table 12, both predictors provided unique statistically significant contributions to the model. Specifically, White race adolescents were shown to be significant (p=.010), as well as the Northeast (p=.000), Midwest (p=.000), and the Southern (p=.000) regions each of which were shown to be significant. Additionally, the model explained .006 (Nagelkerke R^2) of the variance of HPV vaccination and correctly classified 59.7% of cases.

In this model, the odds ratio for other/multiple race adolescents were 1.05 times those of White race adolescents to receive an HPV vaccine, however, this difference was also not statistically significant. Also, in this model, adolescents living in the Midwest were 1.5 times those of adolescents living in the Northeast to have received an HPV vaccine. Also, adolescents

in the South were 1.2 times those of adolescents living in the Northeast to have received an HPV vaccine. The Western region was shown not have a significant effect in comparison to the Northeast region (see Table 12).

Table 12

Binary Logistic Regression: Race and Census Region

		B	S.E.	Wald	*df*	*P*	Odds Ratio	95% C.I. for Odds Ratio	
Race[1]				9.154	2	.010			
	Black	-.052	.033	2.511	1	.113	.949	.890	1.012
	Other/ Multiple	.050	.047	1.157	1	.282	1.052	.960	1.152
Region[2]				154.049	3	.000			
	Midwest	.378	.036	112.027	1	.000	1.460	1.361	1.566
	South	.148	.034	19.395	1	.000	1.160	1.086	1.239
	West	.020	.030	.436	1	.509	1.020	.962	1.081
Constant		.323	.036	82.588	1	.000	1.382		

Note. 1 - White only is the reference group; 2 – Northeast is the reference group

Research Question 2 (RQ2): What is the effect of race and provider-location type on HPV vaccine uptake in adolescents?

To address RQ2, a binary logistic regression was conducted to determine whether there was an effect of race and provider-location type on HPV vaccine uptake in adolescents. The chi-square model, containing the race and provider-location type, predictor variables, was significant, $X^2(7, n = 38{,}706) = 85.72$, $p < .000$. Although, the model was statistically significant, other/multiple race adolescents (p=.305), and all STD/School/Teen clinic (p=.181) did not have a statistically significant impact on the effect of HPV vaccine uptake amongst adolescents. As shown in Table 13, various predictors provided a unique statistically significant contribution to the model. Specifically, the White race (p=.000), and Black race (p=.002) are shown to be significant. All public facilities (p=.000), All hospital facilities (p=.000), all private facilities

(.000), and a Mixture of facilities (p=.021) were statistically significant with a $p<.05$. The model explained .007 (Nagelkerke R^2) of the variance of HPV vaccination and correctly classified 65.5% of cases. Table 13 depicts the binary regression summary.

In this model, the results show that Black race adolescents were 0.86 times less likely than White race adolescents to receive an HPV vaccine. Additionally, other/multiple race adolescents were 1.1 times those of White race adolescents to receive an HPV vaccine, however, this difference was not statistically significant (see Table 13). The results also show that all hospital providers were 0.78 times less likely than those at all public facilities to have received an HPV vaccine. All private facilities were 1.3 times those of all public facilities to have received an HPV vaccine. Moreover, all STD/school/teen clinics were 1.1 times those of all public facilities to have received an HPV vaccine, however, this difference was deemed not statistically significant. Lastly, mixed facilities only .78 times less likely than those of all public facilities to have received an HPV vaccine.

Table 13

Binary Logistic Regression: Race and Provider-Location Type

		B	S.E.	Wald	*df*	*p*	Odds Ratio	95% C.I. for Odds Ratio	
Race[1]				22.253	2	.000			
	Black only	-.155	.049	9.852	1	.002	.857	.778	.944
	Other/ Multiple	.075	.073	1.054	1	.305	1.077	.934	1.242
Provider Location[2]				67.180	5	.000			
	All Hospital Facilities	-.245	.064	14.747	1	.000	.782	.690	.887
	All Private Facilities	.246	.068	13.032	1	.000	1.279	1.119	1.462
	All STD/School/ Teen Clinics	.069	.052	1.786	1	.181	1.072	.968	1.187
	Mixed	-.247	.107	5.293	1	.021	.781	.633	.964
	Unknown	.042	.059	.490	1	.484	1.043	.928	1.171

Constant	.730	.063	136.120	1	.000	2.076

Note. 1 - White only is the reference group; 2 – All Public Facilities is the reference group

Research Question 3 (RQ3): What is the effect of region of the United States and provider-location type, on HPV vaccine uptake in adolescents?

To address RQ3, a binary logistic regression was conducted to determine whether there was an effect of region of the United States and provider-location type on HPV vaccine uptake in adolescents. The model, containing the region and provider-location type, predictor variables, was significant, $X^2(8, n = 38{,}706) = 130.016$, $p < .000$. As mentioned previously, the model was statistically significant, however, the Southern region (p=.129), the Western region (p=.779), All STD/School/Teen Clinic (p=.409), and a mixture of clinics (p=.458) did not have a statistically significant impact on the effect of HPV vaccination amongst adolescents. As shown in Table 14, both predictors provided unique statistically significant contributions to the model. Specifically, the Northeast region (p=.000), and the Midwest region (p=.000) is shown to be significant. All public facilities (p=.000), All hospital facilities (p=.000), and All private facilities (p=.003) are shown to be significant. The model explained .010 (Nagelkerke R^2) of the variance of HPV vaccination and correctly classified 65.5% of cases. Table 14 depicts the binary regression summary.

In this model, the results show that adolescents residing in the Midwest were 1.4 times those adolescents residing in the Northeast to receive an HPV vaccine. Additionally, adolescents residing in the South were 1.1 times those of adolescents residing in the Northeast to receive an HPV vaccine, however, this difference was not statistically significant (see Table 14).

Table 14 also shows that adolescents who seek healthcare in all hospital facilities were only .80 times those at all public facilities to have received an HPV vaccine. Also, adolescents at

private facilities were 1.2 times those at all public facilities to have received an HPV vaccine. Adolescents who attend all STD/school/teen clinics were 1.0 times those at all public facilities to have received an HPV vaccine, however, this difference was not deemed to be statistically significant. Lastly, adolescents that attend mixed facilities are 1.1 times those at all public facilities to have received an HPV vaccine, however the difference was also not deemed to be statistically significant.

Table 14

Binary Logistic Regression: Census Region and Provider-Location Type

		B	S.E.	Wald	*df*	*P*	Odds Ratio	95% C.I. for Odds Ratio	
Region[1]				65.082	3	.000			
	Midwest	.356	0.53	44.701	1	.000	1.428	1.286	1.585
	South	.074	.049	2.299	1	.129	1.077	.978	1.186
	West	-.012	.043	.079	1	.779	.988	.907	1.075
Provider Location[2]				51.176	5	.000			
	All Hospital Facilities	-.229	.064	12.866	1	.000	.795	.701	.901
	All Private Facilities	.201	.069	8.582	1	.003	1.222	1.069	1.398
	All STD/ School/Teen Clinics	.043	.052	.681	1	.409	1.044	.943	1.156
	Mixed	.044	.060	.550	1	.458	1.045	.930	1.174
Constant									

Note. 1 - Northeast is the reference group; 2 – All Public Facilities is the reference group

Research Question 4 (RQ4): Does race modify the relationship of region of the United States, on HPV vaccine uptake in adolescents?

To address RQ4, a binary logistic regression was conducted to determine the significance of the interaction between race and region on HPV vaccine uptake amongst adolescents. The model, containing the race and region interaction, predictor variables, was

significant, $X^2(1, n = 38{,}706) = 13.851$, $p < .000$. The model containing the interaction shows that the interaction between race and region was also statistically significant with a (p=.000) (See Table 15). The model explained .001 (Nagelkerke R^2) of the variance of HPV vaccination and correctly classified 59.7% of cases.

Table 15

Binary Logistic Regression: Race x Region

							95% C.I. for Odds Ratio	
	B	S.E.	Wald	*Df*	*p*	Odds Ratio		
Race by Regio	-.016	.004	13.900	1	.000	.984	.976	.992
Constant	.453	.019	564.940	1	.000	1.572		

Summary

In this chapter, NIS-teen data was used to determine the effect of race, provider-location type, and region on HPV vaccination uptake among adolescents. The data has been identified and analyzed to answer the research questions presented in this study. The sample size of the data was 38,706, missing data was removed from the recoded HPV vaccination receipt, of which 34,980 were included in the analysis.

As a result of the findings, the chi-square test conducted shows that race and region had a statistically significant effect on HPV vaccination uptake among adolescents. The chi-square test also shows that race and provider-location type had a statistically significant effect on HPV vaccination uptake amongst adolescents. Additionally, region and provider-location type results from the chi-square test showed a statistically significant effect on HPV vaccination uptake amongst adolescents. The interaction between race and region was also found to be statistically significant based on the results of the chi-square test.

The binary logistic regression analysis conducted for RQ1 showed statistical significance amongst adolescents of White race, and adolescents residing in the Northeast, Midwest, and South. The binary logistic regression analysis conducted for RQ2 showed statistical significance amongst adolescents of White race and Black race, and adolescents who acquired HPV vaccination at public facilities, hospital facilities, private facilities and mixed facilities. The binary logistic regression analysis conducted for RQ3 showed statistical significance amongst adolescents in the Northeast, Midwest, who accessed services at all public facilities, all hospital facilities, and all private facilities. Lastly, the binary logistic regression analysis conducted for RQ4 showed statistical significance with the interaction of race and region on HPV vaccination uptake amongst adolescents.

As a result of the analysis, the null hypothesis that there is no statistically significant effect of race and region of the United States on HPV vaccine uptake in adolescents was rejected and the alternative hypothesis was accepted. Additionally, the null hypothesis stating that there is no statistically significant effect of race and provider-location type on HPV vaccine uptake in adolescents was rejected and the alternative hypotheses was accepted. The null hypothesis that indicates that there is no statistically significant effect of region of the United States and provider-location type on HPV vaccine uptake in adolescents was also rejected and the alternative hypothesis was accepted. Lastly, the null hypothesis that indicated race does not modify the relationship of region of the United States, on HPV vaccine uptake in adolescents was also rejected, and the alternative hypothesis was accepted.

In Chapter 4 the results of the study were presented, in Chapter 5, I will detail the overall interpretation of the findings, the limitations of the study, recommendations, and implications.

Chapter 5: Discussion

Introduction

The purpose of this quantitative study was to determine if there was an effect of race, provider-location type, and region of the United States on HPV vaccine uptake amongst adolescents. Research conducted previously looked into communication factors, such as provider recommendation and its positive correlation of HPV vaccination willingness. However, there is limited research on specific factors that may affect HPV vaccine uptake in adolescents, hence the reasoning for this study. This study used 2018 NIS Teen data to answer the four research questions. The sample size of the survey consisted of 38,706 respondents. The theoretical framework used for this study was the Health Belief Model, which helped explain the importance of attitude and strategies that can be used to increase the intent and uptake of HPV vaccination amongst adolescents. A Pearson Chi-square test was used to analyze the significance of the model, and a binary logistic regression was used to address each of the research questions.

Summary of Key Findings

There were several key findings from this study. Descriptive statistics were conducted and found that survey respondents were primarily of White race (76.3%), were primarily from the Southern region (39.7%) and seek healthcare at all private providers (20.9%). It was determined that there was a statistically significant effect amongst each of the independent variables, of which include race, provider-location type and region, on the dependent variable of HPV vaccine uptake amongst adolescents. There was a statistically significant effect amongst race and region on HPV vaccine uptake amongst adolescents, with significant races and region having increased HPV vaccination uptake.

There was also a statistically significant effect amongst race and provider-location type. There was also a statistically significant effect among region and provider-location type and amongst the interaction between race and region on HPV vaccination uptake amongst adolescents. I will discuss the interpretation of the findings, limitations of the study, recommendations, and implications of social change.

Interpretation of the Findings

HPV Vaccination and Race

Siriam and Ranganathan (2019) conducted a study that showed Hispanics were 1.47 times more likely than other races to receive HPV vaccination. Burdette et al. (2017) also conducted a survey that showed that minority adolescent males had a higher rate of HPV vaccine initiation and non-Hispanic whites had a lower HPV vaccine initiation. Henry et al. (2016) conducted a study which resulted in higher HPV vaccination among girls in predominately Hispanic areas: 60.4% compared with predominately White areas, 49.9%. According to this study, when analyzing the data for race and provider-location type, White race adolescents and Black race adolescents were shown to be statistically significant, while the other/multiple race adolescents was shown to not have a statistically significant effect on HPV vaccination uptake amongst adolescents. Additionally, when controlling for race and region, the White race was shown to be statistically significant, while Black race and other/multiple race adolescents, showed to not have a statistically significant effect on HPV vaccination uptake among adolescents.

This study shows that when assessing for different variables, there may also be a difference in the effect. For instance, in this study White race was statistically significant when assessed with provider-location type and region. This also shows the need for

further research as to what strategies are working within the White race and Black race adolescents that received HPV vaccination at public, hospital and private facilities and what strategies are working in the White race adolescents in the Northeastern, Midwest, and Southern regions.

HPV Vaccination and Geographical Region

Siriam and Ranganathan (2019) conducted a study that showed adolescent girls residing in the South were less likely to initiate the HPV vaccine compared to adolescent girls residing in the Northeast region. This study confirmed the findings, as the Northeastern region had a significant effect on HPV vaccination rate as compared to adolescents residing in the South when controlling for provider-location type. Moss et al. (2016) also conducted a survey that found that parents were more likely to report collaborative communication if they did not reside in South OR 1.38, 95%, CI [1.06, 1.81].

Within this study, when analyzing for region and provider-location type, the Northeast region and Midwest region were shown to have a statistically significant effect on HPV vaccination uptake amongst adolescents. It was also determined that when analyzing for both region and race, the Northeast region, Midwest region and the Southern region were shown to be significant. Both analyses showed a statistical significance amongst the Northeast and Midwest region, therefore, determining the strategies used within those regions, to implement in the states within the Southern and Western regions to increase HPV vaccination amongst adolescents in these areas.

HPV Vaccination and Provider-Location Type

Garbutt et al. (2018) conducted a study that determined that provider recommendations in the primary care setting informs implementation strategies which results in increased vaccination of HPV vaccine. Katz et al. (2016) determined that further research should look into the strategies to support providers and collaboration at the practice level (Katz, Bogart, Fu, & et al, 2016). Within this study, the analysis of race and provider-location type resulted in statistical significance amongst all public facilities, all hospital facilities, all private facilities, and mixed facilities. Additionally, the analysis of region and provider-location type resulted in statistical significance amongst all public facilities, all hospital facilities and all private facilities.

This study also shows specifically which provider-location types, cohesively along with other predictor variables, including race and region, have a statistically significant effect on HPV vaccination uptake amongst adolescents. This will allow researchers to determine which provider-location types have an increased HPV vaccination uptake amongst adolescents, which will ultimately assist underperforming provider locations determine and implement strategies to increase HPV vaccination.

Theoretical Framework

The theoretical framework used in this study was the HBM. This study found statistical significance among various cohesive factors, amongst race, region, and provider-location type. The statistical significance results proven within this study, amongst race and region, race and provider-location type, region and provider-location type, and the interaction between race and region, shows that the attitudes and perceptions discussed within the HBM, can have a significant effect on certain factors

pertaining to HPV vaccination uptake amongst adolescent. Additionally, the results of the study provides the groundwork for identifying strategies used by the factors of race, provider-location and region, resulting in an increased HPV vaccination amongst adolescents. The specific factors included, White race adolescents, receiving HPV vaccination in the Northeast, South and Midwest regions, White race and Black race adolescents receiving HPV vaccination at public, hospital, private and mixed facilities; and adolescents that reside in the Northeast, and Midwest region, that receive HPV vaccination at public, private or hospital facilities. Conducting further research and identifying the strategies that are used among the aforementioned variables and ultimately applying them to the underperforming strategies will address each construct of the HBM and increase HPV vaccination in adolescents, among all races, all regions, and all provider-location types.

Limitations of the Study

The study showed that 52% of provider-location types were missing. This is a limitation of the study as it is more than half of the participants. If this information were included in the survey, it may have changed the trajectory of the provider-location type results. There is also a limitation on positively concluding that increased HPV vaccination among adolescents were a definite result of race, region, and provider-location type.

An additional limitation of this study is generalizability. Generalizability is the degree to which the results of the sample of participants used for a research study reflect what the results would be “in the real world” (Frey, 2018). Generalizability in this study includes the inability to survey the entire population of the United States, and the

limitations from individuals who do not have access to a landline telephone, which was the way in which the survey was conducted. Ultimately, this can result in the results being unrepresentative of the population, which results in lack of generalizability. Lastly, the final limitation is the reporting of inaccuracies in responses, this may cause validity and reliability issues; CDC attempts to prevent these issues by conducting follow-up with providers following the survey.

Recommendations

The recommendations of this study, include further research conducted to identify specific strategies among White and Black race adolescents who received HPV vaccinations at public, hospital, and private facilities. Additionally, further research should identify specific strategies among White race adolescents residing in the Northeast, Midwest, and Southern region. Further research should look into the strategies used for adolescents residing in the Northeast and Midwest that received an HPV vaccine at a public, hospital and private facilities. This research will aid in increasing HPV vaccination rates among adolescents other/multiple race adolescents, and adolescents residing in the West, and those seeking care in STD/school/teen clinics and mixed facilities.

There should also be a cohesive strategy used across the races, regions, and provider-location type, to obtain a cohesive result of increased HPV vaccination amongst adolescents. Education, awareness, and accessibility should be further researched as this may lead to further investigations into the barriers experienced amongst the different variables.

This study can help target the states, providers, and races across the country that have an increased HPV vaccination rates and those that are lagging, and can aid in determining whether a cohesive effect exists, and whether there are specific strategies in the well performing HPV vaccination areas that can be relayed and transferred to the HPV vaccination underperforming areas.

Implications

It has been defined that the premise of positive social change is the intent of creating and applying ideas, strategies, and actions to promote the worth, dignity, and development of individuals, communities, organizations, institutions, cultures, and societies, through a series of processes (Walden University, 2020). In this study there are several implications for positive socials changes. The potential impact for social change at the organizational level can be accomplished with identifying races, provider-location types, and regions that have increased HPV vaccination and understanding the strategies that can be relayed to underperforming variables. This will enable increased performance for those variables that are lagging and ultimately an increase in HPV vaccination amongst adolescents which will also lead to individualized social change.

This study will aid in identifying areas of increased HPV vaccination rate, and ultimately lead to an understanding of the strategies that are most successful for further research; this will help increase HPV vaccination across the United States, consistently. This will also prevent certain cancers and decease cancer rates amongst both, women and men.

Conclusion

The HPV vaccine is a significant public health advancement that has the ability to prevent recurring HPV infection and ultimately save many lives. This results of this study showed that race and region had a statistically significant effect on HPV vaccination uptake amongst adolescents; specifically, White race, the Northeast, Midwest, and the Southern regions were shown to be statistically significant. This study also showed that race and provider-location type had a statistically significant effect on HPV vaccine uptake amongst adolescents, specifically, the White and Black race was shown to be significant, in addition to all public facilities, all hospital facilities, all private facilities, and a mixture of facilities. This study also showed that provider-location type and region were shown to be statistically significant; specifically, the Northeast region, and the Midwest region were shown to be significant, in addition to all public facilities, all hospital facilities, and all private facilities. Lastly, the results of this study showed that the interaction between race and region were found to be statistically significant in its effect on HPV vaccination amongst adolescents.

This study was conducted to determine the various factors that have an effect on HPV vaccination uptake amongst adolescents. The areas where there is an increased level of HPV uptake were determined using a binary logistic regression, and assisted with determining the areas where HPV vaccination rates were lagging. This ultimately will aid in determining the strategies being used that are positively increasing HPV vaccination rates in adolescents, and sharing those strategies with the areas that are lagging. This study provides the background information and foundation base for further research in determining the strategies, and whether those strategies increase HPV vaccination rates in

those areas. HPV is vital for the health of men and women, and it is my thought that with increased HPV vaccination rates in adolescence, will undoubtedly lead to the prevention of certain cancers and ultimately save many lives.

References

Ault K. A. (2006). Epidemiology and natural history of human papillomavirus infections in the female genital tract. *Infectious diseases in obstetrics and gynecology*. 40470. doi:10.1155/IDOG/2006/40470

Burdette, A., M., Webb, N., S., Hill, T., & et al. (2017). Race-specific trends in HPV vaccinations and provider recommendations: Persistent disparities or social progress. *Public Health, 142*, 176-176. doi:10.1016/j.puhe.2016.07.009

Cancer.gov. (2019). Human papillomavirus (HPV) vaccines. Retrieved from https://www.cancer.gov/about-cancer/causes-prevention/risk/infectious-agents/hpv-vaccine-fact-sheet

Census.gov. (2017). Race and ethnicity. Retrieved from https://www.census.gov/mso/www/training/pdf/race-ethnicity-onepager.pdf

Centers for Disease Control and Prevention. (2018). About the national immunization surveys (NIS). Retrieved from https://www.cdc.gov/vaccines/imz-managers/nis/about.html

Centers for Disease Control and Prevention. (2019). ACIP recommendations. Retrieved from https://www.cdc.gov/vaccines/acip/recommendations.html

Centers for Disease Control and Prevention. (2019). Genital HPV infection - fact sheet. Retrieved from https://www.cdc.gov/std/hpv/stdfact-hpv.htm

Centers for Disease Control and Prevention. (n.d.). Human papillomavirus. Retrieved from https://www.cdc.gov/vaccines/pubs/pinkbook/downloads/hpv.pdf

Centers for Disease Control and Prevention. (2017). Barriers to human papillomavirus (HPV) vaccination among adolescents in the United States. Retrieved from https://www.cdc.gov/cancer/dcpc/research/articles/hpv-barriers.htm

Centers for Disease Control and Prevention. (2015). How to use the NIS data. Retrieved from https://www.cdc.gov/vaccines/imz-managers/coverage/nis/child/how-to.html

Centers for Disease Control and Prevention. (2018). HPV vaccination coverage data. Retrieved from https://www.cdc.gov/hpv/hcp/vacc-coverage/index.html.

Centers for Disease Control and Prevention. (2017). Human papillomavirus statistics. Retrieved from https://www.cdc.gov/std/hpv/stats.htm

Centers for Disease Control and Prevention. (2019). Human papillomavirus. Retrieved from https://www.cdc.gov/vaccines/pubs/pinkbook/hpv.html

Centers for Disease Control and Prevention. (2018). National immunization survey. Retrieved from https://www.cdc.gov/vaccines/imz-managers/nis/index.html.

Deshmukh, U., Oliveira, C., R., Griggs, S., & et al. (2018). Impact of a clinical interventions bundle on uptake of HPV vaccine at an OB/GYN clinic. *Science Direct, 36*(25). doi:10.1016/j.vaccine.2018.05.039

Frey, B. (2018). Generalizability. *SAGE Journals*. doi:10.4135/9781506326139.n284

Garbutt, J., M., Dodd, S., Walling, E., & et al. (2018). Barriers and facilitators to HPV vaccination in primary care practices: A mixed methods study using the consolidated framework for implementation research. *BMC Family Practice,19*(1), 53. doi:10.1186/s12875-018-0750-5

Hanson, K. E., McLean, H. O., Belongia, E., D., & et al. (2019). Sociodemographic and clinical correlates of human papillomavirus vaccine attitudes and receipt among

Wisconsin adolescents. *Papillomavirus Research, 33*(3), 647 doi:10.1016/j.pvr.2019.05.001.

Head, K. J., Biederman, E., Sturm, L. A., & Zimet, G., D. (2018). A retrospective and prospective look at strategies to increase adolescent HPV vaccine uptake in the United States. *Human Vaccines & Immunotherapeutics.*14(7). doi:10.1080/21645515.2018.1430539

Hendrix, K. S., (2015). When parents hesitate about vaccines, what should health-care providers say. Retrieved from http://theconversation.com/when-parents-hesitate-about-vaccines-what-should-health-care-providers-say-37957.

Henry, K. A., Stroup, A. M., Warner, E. L., & Kepka, D. (2016). Geographic factors and human papillomavirus (HPV) vaccination initiation among adolescent girls in the United States. *Cancer epidemiology, biomarkers & prevention: a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology*, *25*(2), 309–317. doi:10.1158/1055-9965.EPI-15-0658

Jones, C. L., Jensen, J. D., Scherr, C. L., Brown, N. R., Christy, K., & Weaver, J. (2015). The Health Belief Model as an explanatory framework in communication research: Exploring parallel, serial, and moderated mediation. *Health communication*, *30*(6), 566–576. doi:10.1080/10410236.2013.873363

Katz, I. T. Bogart, L, M., Fu, C. M., & et al. (2016). Barriers to immunization among blacks and latinos: a qualitative analysis of caregivers, adolescents, and providers. *BMC Public Health*. 16(874). doi:10.1186/s12889-016-3529-4

Kissal, A. & Kartal, B. (2019), Effects of health belief model-based education on health beliefs and breast self-examination in nursing students. Asia Pac J Oncol Nurs. *6*(4), 402-410. doi:10.4103/apjon.apjon_17_19

Laerd Statistics. (2018). Binomial logistic regression using SPSS statistics. Retrieved from https://statistics.laerd.com/spss-tutorials/binomial-logistic-regression-using-spss-statistics.php

Laerd Statistics. (2018). Chi-square test for association using SPSS statistics. Retrieved from https://statistics.laerd.com/spss-tutorials/chi-square-test-for-association-using-spss-statistics.php

Laerd Statistics. (2018). Multiple regression analysis using SPSS statistics. Retrieved from https://statistics.laerd.com/spss-tutorials/multiple-regression-using-spss-statistics.php

Laerd Statistics. (2012a). Threats to external validity. Retrieved from http://dissertation.laerd.com/external-validity-p3.php#sampling-bias

Laerd Statistics. (2012b). Threats to internal validity. Internal validity. Retrieved from http://dissertation.laerd.com/internal-validity.php#threats

Louis, J. P. (2019). Exploring constructs of the Health Belief Model as predictors to Haitian men's intention to screen for prostate cancer. *Urologic Nursing, 39*(2), 72-82. doi:10.7257/1053-816X.2019.39.2.72

Moss, J. L., Gilkey, M., B., Rimer, B., K., & et al. (2016). Disparities in collaborative patient-provider communication about human papillomavirus (HPV) vaccination.

Human Vaccines & Immunotherapeutics. *12*(6). doi: 10.1080/21645515.2015.1128601

National Geographic. (2019). United states regions. Retrieved from https://www.nationalgeographic.org/maps/united-states-regions/

National Vaccine Advisory Committee. (2016). Overcoming barriers to low HPV vaccine uptake in the United States: recommendations from the national vaccine advisory committee: approved by the national vaccine advisory committee on June 9, 2015. *Sage Journals. 131*(1), 17-25. doi: 10.1177/003335491613100106

Polonijo, A., N., Carpiano, R., M., Reiter, P., L., & Brewer, N., T. (2016). Socioeconomic and racial-ethnic disparities in prosocial health attitudes: the case of human papillomavirus (HPV) vaccination for adolescent males. *Journal of Health and Social Behavior*. *57*(3). doi:10.1177/0022146516660344

Raosoft. (2004). Sample size calculator. Retrieved from http://www.raosoft.com/samplesize.html.

Rosenstock I., M. (1974). Historical origins of the health belief model. *Sage Journals*. doi: 10.1177/109019817400200403

Sacred Heart University Library. (n.d.). Organizing academic research papers: Types of research designs. Retrieved from https://library.sacredheart.edu/c.php?g=29803&p=185902

Shawhan, A., & Ruppe, R., L. (2019). Increasing human papillomavirus vaccination rates among adolescents: overcoming vaccine hesitancy and using practice

improvements. *The Journal for Nurse Practitioners.15(*8). doi: 10.1016/j.nurpra.2019.04.013

Sriram, S., & Ranganathan, R. (2019). Why human papilloma virus vaccination coverage is low among adolescents in the US? A study of barriers for vaccination uptake. *Journal of family medicine and primary care*, *8*(3), 866–870. doi:10.4103/jfmpc.jfmpc_107_19

Trochim, W. MK., (2020). Research methods knowledge base. Retrieved from https://socialresearchmethods.net/kb/construct-validity-threats/

Valentino, K., & Poronsky, C., B. (2016). Human papillomavirus infection and vaccination. *Journal of Pediatric Nursing.* 31(2). doi: 10.1016/j.pedn.2015.10.005

Ventola C. L. (2016). Immunization in the United States: Recommendations, Barriers, and Measures to Improve Compliance: Part 1: Childhood Vaccinations. *P & T : a peer-reviewed journal for formulary management*, *41*(7), 426–436. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5403619/.

Walden University. (2017). A vision for social change. Retrieved from https://www.waldenu.edu/-/media/Walden/files/about-walden/walden-university-2017-social-change-report-final-v-2.pdf.

Walden University. (2020). Themes and mission. Retrieved from https://academicguides.waldenu.edu/social-change/about-us/#:~:text=Walden%20University%20defines%20positive%20social,institutions%2C%20cultures%2C%20and%20societies.

Appendix A: Questions from the 2018 NIS Used for This Study

Questions 1 will provide variables related to HPV vaccination.

Q1: Has [TEEN] ever received HPV shots?

1. Yes
2. No
3. Don’t Know
4. Refused

Questions 5 will provide the variables related to race.

Q5: Is [TEEN] White, Black or African American, American Indian, Alaska Native, Asian, Native Hawaiian or Pacific Islander?

1. White
2. Black/African American
3. American Indian
4. Alaska Native
5. Asian
6. Native Hawaiian
7. Pacific Islander
8. Other
9. Don’t Know
10. Refused

1. Refused

Questions 9-12 will provide the variables related to Region of the United States.

Q9: What is your zip code?

1. ____
2. Don't Know
3. Refused

Q10: In what city, county, and state do you live?

1. Enter City
2. Enter County
3. Enter State

Q11: To confirm, you live in [CITY}, [COUNTY], [STATE]. Is that correct?

1. Yes
2. No

Q12: To confirm, I have your zip code as _____. Is that correct?

1. Yes
2. No
3. Don't Know
4. Refused

Question 13 will provide the variables for provider-location type?

Q13: Please tell me all the types of places where [TEEN} has received an HPV shot: This question is referring to the location of the vaccine provider, not to the location on the body where the shot was given.

1. Doctor's Office
2. Emergency Room
3. Health Department
4. Clinic or Health Center
5. Hospital-Based Clinic
6. While Hospitalized
7. Other Medically Related Place
8. Pharmacy, Drug Store, or Supermarket Pharmacy
9. Workplace
10. Elementary/Middle/High School
11. Other Non-medically related place
12. Mall Outreach
13. Village Outreach (Guam)
14. Don't Know
15. Refused