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Human Papillomavirus: Identifying Vaccination Rates, Barriers, and Information Gathering among College Women Ages 18-26

Timmerie Cohen
Virginia Commonwealth University

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Human Papillomavirus: Identifying Vaccination Rates, Barriers, and Information Gathering among College Women Ages 18-26

A dissertation submitted in partial fulfillment of the requirements for the degree Doctor of Philosophy at Virginia Commonwealth University

by

Timmerie Fay Cohen MS, RT (R) (T), CMD
Master of Science, Virginia Polytechnic Institute and State University, 2007
Bachelor of Science, Virginia Commonwealth University, 1997

Director: Janet R. Hutchinson PhD
Chairman Gender Sexuality and Women’s Studies
L. Douglas Wilder School of Government and Public Affairs

Virginia Commonwealth University
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# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of Tables</td>
<td>vii</td>
</tr>
<tr>
<td>List of Figures</td>
<td>viii</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>ix</td>
</tr>
<tr>
<td>Abstract</td>
<td>xi</td>
</tr>
</tbody>
</table>

## Chapter 1 Introduction

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Statement of Problem</td>
<td>1</td>
</tr>
<tr>
<td>Literature Review Summary</td>
<td>4</td>
</tr>
<tr>
<td>Policy Considerations</td>
<td>8</td>
</tr>
<tr>
<td>Methods</td>
<td>10</td>
</tr>
<tr>
<td>Research Problem</td>
<td>10</td>
</tr>
<tr>
<td>Research Question</td>
<td>10</td>
</tr>
<tr>
<td>Null Hypotheses</td>
<td>10</td>
</tr>
<tr>
<td>Available Data to be Analyzed</td>
<td>11</td>
</tr>
<tr>
<td>Summary of Findings</td>
<td>14</td>
</tr>
<tr>
<td>Discussion</td>
<td>18</td>
</tr>
<tr>
<td>Limitations of the Analysis</td>
<td>21</td>
</tr>
<tr>
<td>Strengths of the Analysis</td>
<td>21</td>
</tr>
<tr>
<td>Conclusion</td>
<td>22</td>
</tr>
</tbody>
</table>
## Chapter 2 Literature Review

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>24</td>
</tr>
<tr>
<td>Human Papillomavirus (HPV)</td>
<td>24</td>
</tr>
<tr>
<td>Cervical Cancer Rates in the US</td>
<td>26</td>
</tr>
<tr>
<td>Global Cervical Cancer Rates</td>
<td>28</td>
</tr>
<tr>
<td>Screening Practices in the US for Cervical Cancer and HPV</td>
<td>28</td>
</tr>
<tr>
<td>HPV Vaccination</td>
<td>31</td>
</tr>
<tr>
<td>Health Belief Model</td>
<td>37</td>
</tr>
<tr>
<td>College Women and HPV Vaccination</td>
<td>43</td>
</tr>
<tr>
<td>Policy Implications</td>
<td>50</td>
</tr>
<tr>
<td>Conclusion</td>
<td>54</td>
</tr>
</tbody>
</table>

## Chapter 3 Methods

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>56</td>
</tr>
<tr>
<td>Research Problem</td>
<td>56</td>
</tr>
<tr>
<td>Research Question</td>
<td>56</td>
</tr>
<tr>
<td>Null Hypotheses</td>
<td>56</td>
</tr>
<tr>
<td>Available Data to be Analyzed</td>
<td>57</td>
</tr>
<tr>
<td>Unit of Analysis</td>
<td>57</td>
</tr>
<tr>
<td>Source of the National College Health Assessment</td>
<td>58</td>
</tr>
<tr>
<td>Survey Instrument</td>
<td>59</td>
</tr>
<tr>
<td>Reliability and Validity Analysis</td>
<td>61</td>
</tr>
</tbody>
</table>
Data Analysis............................................................................................................. 62
Brief Summary Selection of Independent Variables.................................................. 65
  Race, Age, and Geographic Region........................................................................... 65
  Receiving Sexually Transmitted Disease Information........................................... 66
  Gynecological Exam in Past 12 months................................................................. 66
  Received Hepatitis B Vaccination........................................................................... 67
  Received Influenza Vaccination............................................................................. 67
  Primary Source of Health Insurance....................................................................... 67
  Number of Sexual Partners in the Past 12 Months................................................ 67
Conclusion.................................................................................................................. 68

Chapter 4 Results
  Introduction.............................................................................................................. 69
    Demographics by Race......................................................................................... 70
    Demographics by Geographic Location............................................................. 71
    HPV Vaccination by Race.................................................................................... 72
    HPV Vaccination by Geographic Location.......................................................... 73
    Information Gathering.......................................................................................... 73
    Health Behaviors.................................................................................................. 75
    Correlations.......................................................................................................... 83
    Binary Logistic Regression Model........................................................................ 84
    Binary Logistic Regression Results...................................................................... 84
Conclusion.................................................................................................................. 90
Chapter 5 Discussion

Introduction ........................................................................................................................................ 92

The Influence of Race on HPV Vaccination and Gynecological Exam………… 93

The Importance of Provider Recommendation .................................................................................. 98

Past Vaccination Status and HPV Vaccination .............................................................................. 99

Number of Sexual Partners and the Effect on HPV Vaccination ................................................. 100

Geographic Region and HPV Vaccination ...................................................................................... 101

Receiving Sexually Transmitted Disease Information and HPV Vaccination ............................. 102

Strengths of the Analysis .................................................................................................................. 103

Limitations of the Analysis .............................................................................................................. 104

Conclusion ...................................................................................................................................... 105

Chapter 6 Conclusion

Introduction ...................................................................................................................................... 107

Policy Implications .......................................................................................................................... 108

Conclusion ...................................................................................................................................... 109

References ...................................................................................................................................... 110
Appendices

A Centers for Disease Control and Prevention Cervical Cancer Screening for the Average Risk Female .......................................................... 126

B Meeting Summary: President’s Cancer Panel Achieving Widespread HPV Vaccine Uptake ........................................................................ 128

C Brochure Used by the American College Health Association-National College Health Assessment for Participant Recruitment .................................. 131

D Approval Letter and Guidelines for the Use of Secondary Data................. 138

E Definition of Geographic Location/United States Census Bureau Map......... 141

F Variable Coding, Omnibus Test of Model Coefficients, Model Summary, Hosmer and Lemeshow Test and Contingency Table, and Classification Table. 144

G Executive Summary ............................................................................ 148
# List of Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2</td>
<td>Odds-ratios and 95% confidence intervals of racial categories that were</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>statistically significant in the binary logistic regression.</td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Common HPV types: disease and signs/symptoms.</td>
<td>25</td>
</tr>
<tr>
<td>3.1</td>
<td>Reported rates.</td>
<td>63</td>
</tr>
<tr>
<td>3.2</td>
<td>Variables included in the binary logistic regression analysis.</td>
<td>64</td>
</tr>
<tr>
<td>4.1</td>
<td>Demographics.</td>
<td>71</td>
</tr>
<tr>
<td>4.2</td>
<td>Number of women by geographic region.</td>
<td>71</td>
</tr>
<tr>
<td>4.3</td>
<td>Women who received the HPV vaccine by race.</td>
<td>72</td>
</tr>
<tr>
<td>4.4</td>
<td>HPV vaccination rates by geographic region.</td>
<td>73</td>
</tr>
<tr>
<td>4.5</td>
<td>Received STD information (information gathering).</td>
<td>74</td>
</tr>
<tr>
<td>4.6</td>
<td>Health behaviors.</td>
<td>82</td>
</tr>
<tr>
<td>4.7</td>
<td>Correlation between measures.</td>
<td>83</td>
</tr>
<tr>
<td>4.8</td>
<td>Variables in the equation.</td>
<td>86</td>
</tr>
<tr>
<td>4.9</td>
<td>Odds-ratios with 95% confidence intervals.</td>
<td>89</td>
</tr>
</tbody>
</table>
List of Figures

1.1 Percentage of women who received the HPV vaccine with racial categories................................................................. 14

4.1 Percentage of respondents that received the HPV vaccination when examining receiving and not receiving the STD information.............. 75

4.2 Percentage of students that received HPV vaccination by gynecological exam status.......................................................... 77

4.3 Percentage of respondents that received the HPV vaccine when examining Hepatitis B vaccination status........................................ 78

4.4 Percentage of respondents that received the HPV vaccine when examining Influenza vaccination status........................................ 79

4.5 Percentage of respondents who received the HPV vaccine by source of health insurance......................................................... 81
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Abstract

HUMAN PAPILLOMAVIRUS: IDENTIFYING VACCINATION RATES, BARRIERS, AND INFORMATION GATHERING AMONG COLLEGE WOMEN AGES 18-26

By Timmerie Fay Cohen, Ph.D.

A dissertation submitted in partial fulfillment of the requirements for the degree Doctor of Philosophy at Virginia Commonwealth University

Virginia Commonwealth University, 2013

Major Director: Janet R. Hutchinson PhD
Chairman Gender Sexuality and Women’s Studies
L. Douglas Wilder School of Government and Public Affairs

This dissertation examines vaccination rates for Human Papillomavirus (HPV) among college women 18-26 years of age who participated in the American College Health Association’s National College Assessment (ACHA-NCHA). Utilizing secondary data, this research sought to report HPV vaccination rates among a racially diverse population and to identify potential barriers to vaccination.

The ACHA-NCHA survey provided a large sample size (N=68,193) in which to perform a binary logistic regression analysis. Demographic characteristics were analyzed as potential barriers to HPV vaccination. Additionally, lack of certain health behaviors were explored as potential barriers to HPV vaccination.
In this study, White/non-Hispanic women had a higher HPV vaccination rate when compared to minority women. The binary regression analysis demonstrated that minority women were less likely to receive the HPV vaccine. Furthermore, it was determined that as the age of the respondents increased, the likelihood of receiving the vaccine decreased. Health behaviors that were predictive of receiving the HPV vaccine included receiving the Hepatitis B and Influenza vaccine, number of sexual partners and receiving sexually transmitted disease information. Women who received a gynecological exam were almost twice as likely to receive the vaccine, as were women who had parental health insurance coverage.

One aim of The Affordable Care Act (2010) is to decrease disparities in health care. Drawing attention to potential barriers to HPV vaccination allows policy makers to make informed decisions regarding future activities to reduce disparities. Health promotion activities should be targeted to specific populations in an effort to increase HPV vaccination rates.
Chapter 1

Introduction

Statement of Problem

The introduction of a new vaccine does not end with Federal Drug Administration (FDA) approval and recommendation from the Centers for Disease Control and Prevention (CDC). Scientific acceptance is not enough, barriers to vaccination exist. Increasing voluntary vaccination rates is a complex process for which there is no simple solution. Immunization strategies to reach targeted populations, those who benefit from the vaccine, include strategic planning by public health officials, healthcare organizations, healthcare providers, advocates, and other stakeholders. Research is imperative to gain an understanding of the barriers to vaccination adoption. The United States has an increasingly diverse population. Gender, race, age, socioeconomic status, education and healthcare utilization patterns are some of the factors shown in the literature to influence vaccination uptake.

The purpose of this research is to describe Human Papillomavirus (HPV) vaccination rates and possible barriers to HPV vaccination among college women ages 18-26. The American College Health Association’s National College Health Assessment (NCHAII) survey provided this analysis with a large sample (N=68,193) of college women to extend the body of knowledge concerning HPV vaccination rates.
Introduction

The Human Papillomavirus (HPV) is the most common sexually transmitted disease in the United States and has been strongly linked to cervical cancer. More than 100 types of HPV have been identified. However, types 16 (HPV-16) and 18 (HPV-18) are responsible for up to 98% of all cervical cancers, and types 6 and 11 are associated with genital warts (Schiffman, et al., 2007, Walboomers, 1999). According to the Centers for Disease Control and Prevention (CDC), 50% of the reproductive-age population in the United States has been infected with HPV. Although this would appear to be a staggering figure, many of the HPV types are asymptomatic and do not lead to non-invasive or invasive carcinomas. Following the natural history of HPV has proved difficult since the virus can be transient (Goldie, et al., 2003, Schiffman, et al., 2007). Age-specific models of HPV infection and development of cancerous lesions would benefit health policy makers, but conclusive models remain elusive due to the transient nature of the virus.

Approximately 12,000 women are diagnosed with cervical cancer annually and 4,000 of those women will die (NCI, Cervical Cancer Fact Sheet, 2012). Cervical cancer comprises 20% of gynecologic cancers in the United States. The average age of onset of cervical cancer is 45 to 55 years; black, Hispanic, and Native American women are at increased risk of developing cervical cancer compared to Caucasian women (CDC, Cervical Cancer Fact Sheet, 2012). The populations at greatest risk for HPV infection are men and women aged 20-24 (CDC, Cervical Cancer Fact Sheet, 2012, Schiffman, et al., 2007). Globally, annual cervical cancer rates are much higher, with 500,000 confirmed cases and 275,000 deaths (WHO, Global Cancer Statistics, 2010). Due to the incidence of cervical cancer, women suffer disproportionately from HPV, but men and women can both harbor and transmit HPV.
For decades, Papanicolaou testing (the Pap smear) was the physician’s principal tool for the early detection of cervical cancer. The Pap smear is performed to screen for pre-invasive cervical lesions and invasive cervical malignancies and thus prevent cervical cancer in sexually active women. It has been a highly effective test: since the 1950s the cervical cancer rate in the United States has decreased 80% due to Pap smear testing. Until 2012, Pap smear testing was recommended yearly for women who were sexually active or over the age of 18; however, recommendations have changed to start Pap testing at the age of 21, or three years after initiating intercourse. Yearly screening has been replaced with the recommendation that women with negative Pap results and those who are under 30 receive Pap testing every three years. The new recommendation for average risk women 30-65 is to receive Pap testing every 3-5 years. Any positive Pap test in the past calls for yearly testing. The CDC has published current 2012 screening guidelines for average-risk women (See Appendix A).

Still, as the cervical cancer rates cited above show, it is not prevented in thousands of women. In June 2006, physicians gained a valuable addition to their toolbox. The first vaccine to prevent HPV infection was approved by the United States Food and Drug Administration (FDA) for use in girls and young women, ages 9 to 26. The vaccine was also deemed safe for males (Markowitz et al., 2007, National Cancer Institute, Cervical Cancer Fact Sheet, 2012). It provides nearly 100% protection against HPV types 16 and 18, thus greatly reducing the likelihood of developing cervical cancer by 75%. The vaccine is given in a series of three intramuscular shots over a 6-month period at an average cost of $320.00. The current recommendation is that females and males get the vaccine between the ages of 11-12 or before first sexual contact. This ensures that the vaccine offers the most benefit (CDC, Cervical Cancer Fact Sheet, 2012).
At first glance, one would assume that a vaccine that prevents cancer would be widely endorsed by physicians and sought after by patients. However, controversy surrounds this vaccine. Public health policymakers have encountered determined resistance to the vaccine from some parents, either because of general concerns about vaccine safety or specific objections to this vaccine because of its perceived connection with sexual activity. One concern is “that vaccination against a sexually transmitted disease would increase sexual activity in young girls and unmarried women” although no data supports this assertion (Balong, 2009, Colgrove, 2006, National Conference of State Legislatures, HPV vaccination, 2012). It is argued by some that there is a moral justification for compulsory HPV vaccination. The public health standpoint is that vaccinations are used to reduce harm to individuals, and the HPV vaccine does that by protecting against a common virus (Balong, 2009, Zimmerman, 2006).

**Literature review summary**

Increasing the rate of the HPV vaccination has been of interest to public health authorities and non-governmental organizations since the vaccine was approved by the FDA and recommended by agencies such as the CDC. Vaccination of adolescent females, ages 11-12, before they enter middle school was mandated by Virginia and the District of Columbia, with an option for parents to opt out of the requirement. Twenty-two states have had legislation introduced to mandate vaccination for girls entering middle school, but all such bills were either withdrawn or sent to committee without further action. New Mexico passed legislation that was later vetoed by the governor. In 2007, the Governor of Texas mandated vaccination for HPV; however, the executive order was rescinded by the state House and Senate (National Conference of State Legislatures, HPV vaccination, 2013). This widespread lag in policy action by states means that even if they mandate in the future that middle school girls be vaccinated for HPV,
there will be a large catch-up group of females aged 18-26 that may suffer disproportionately from HPV infection. The American Public Health Association (2009) reported that only 41% of female undergraduate students surveyed were vaccinated for HPV. This prevalent sexually transmitted disease is not only responsible for cervical cancer in women, but also 40% of vaginal cancers and vulvar cancers. In men, HPV is linked to 90% of anal cancers and penile cancers and 12% of oropharyngeal cancers (Kim, et al., 2008, National Cancer Institute, Cervical Cancer Fact Sheet, 2012). Both men and women, therefore, could realize significant benefit from the HPV vaccination.

For women who already have had sexual intercourse, some studies suggest that the vaccine could offer some protection (Adams, et al., 2009, Castellsague, et al., 2011, Harper, et al., 2004). The CDC supports vaccination in women up to the age of 26 which may be beneficial where there is no prior exposure to the virus, when there is transient virus, or when it can provide protection from non-present HPV strains (Adams, et al., 2009, Castellsague, et al., 2011, Harper, et al., 2004). While vaccination in women over the age of 17 is supported by federal agencies, realizing an increase in vaccination rates is not solely dependent on recommendation.

The Health Belief Model (HBM) is a cognition model often used in explaining and predicting health behaviors. The constructs of the model are perceived susceptibility, perceived severity, perceived barriers and benefits, and cues to action (Becker, 1974). Applied to the public health policy implications of HPV transmission and its prevention, through education and vaccination, the HBM can shed light on current knowledge deficits and predict useful avenues of research to explore.

Research has shown that women are unlikely to believe they are susceptible to HPV, even though it is the most common sexually transmitted disease (McAlearney, et al., 2010,
Nadarzynski, et al., 2012). In one study that used the HBM framework, 80% of women believed that they were not at risk from STD’s when in reality they were. Even though 99% of women believed that STD’s and cancer are serious, only 16% believed that they were at risk for the development of cervical cancer (Burak, et al., 1997). Providing information clearly explaining the link between HPV and cervical cancer along with infection risk is important when undertaking educational efforts (Nadarzynski, et al., 2012).

Knowledge of the HPV virus and its negative repercussion is not uniformly pervasive among adult women (Baer, et al., 2000, D’Urso, et al., 2007, Gerend, et al., 2008, Giede, et al., 2010, Kahn, et al., 2007 Philips, et al., 2003). College students are a high-risk group for contracting and spreading HPV, yet most students do not believe they are at risk (Ramirez, et al., 1997, Zimet, et al., 2006, Yacobi, et al., 1999). Race is also considered a barrier to vaccination; in one study blacks were less likely to receive the HPV vaccine (Bendik, et al., 2011). Identifying information-gathering behavior and vaccination rates in college age women can guide the best allocation of resources to be used in educating women aged 18-26 about this virus and its repercussions. While knowledge of HPV and its link to the development of cancer has increased since the development of the vaccine, HPV remains a major concern.

Barriers to HPV vaccination include deficiency in knowledge about the virus and prevention of its related diseases. The lack of knowledge that the virus is responsible for the development of cancer and genital warts, but it also applies to the knowledge deficits concerning the cost of the three-shot series of the vaccine, the misperceptions of vaccine safety, and vaccine effectiveness in general (Blumenthal, et al., 2008, Brewer, et al., 2007, Jones, et al., 2008, Rosenthal, et al., 2011). Studies have shown a physician recommendation increases the likelihood that women will seek the HPV vaccine (Brewer, et al., 2007, Giambi, et al., 2011,
Rosenthal, et al., 2011). Cermak, et al., reported that women said their physicians were not providing them with information regarding HPV and its link to cancer. The survey included 109 professional women of whom 71.6% reported that their physicians did not discuss HPV with them. In addition, all the women in this study had a gynecological exam within 18 months (Cermak, et al., 2010).

Women receive information regarding HPV and its negative consequences by physician patient education, media, printed materials, and parent and peer education. There is inconsistency in the knowledge gained by women (Hall, et al., 2008). Content analysis of media sources showed that misleading and missing information abounds regarding HPV (Ache, et al., 2008, Hall, et al., 2008, Kelly, et al., 2009). Also, physician to patient education tends to be inconsistent (Cermak, et al., 2010, Kahn, et al., 2007). Accurate, non-judgmental education could provide women with the information needed to make an informed decision regarding vaccination (Kahn, et al, 2007).

The cost of the vaccine to the patient was also shown to be a barrier. Women of lower socioeconomic status with no insurance coverage were less likely to receive the HPV vaccine (Kahn, et al., 2008). In addition to a lack of knowledge concerning HPV, vaccine safety, costs, and future toxicity are barriers to vaccination (American Public Health Association, Adult Vaccine Coverage, 2010).

The intent of adult women to receive the HPV vaccine is linked to greater perceived risk of infection, multiple sexual partners, having a close friend or relative with a HPV linked illness, and greater knowledge of the virus (Jones, et al., 2008). Intent to receive the HPV vaccination has also been linked to an increase in sexual partners (Bendik, et al., 2011, Jones, et al., 2008, Kahn, et al., 2003). Physician recommendation increases intention to receive the vaccination
series (Brewer, et al., 2007, Giambi, et al., 2011, Rosenthal, et al., 2011). Voluntary vaccinations, such as the influenza vaccine, are often dependent on society’s common concerns, perceptions of vaccine safety, perceptions of personal risk, and side effects (Poland, 2010). Voluntary HPV vaccination may share these same obstacles.

Policy Considerations

Increasing the HPV vaccination rate among women ages 18-26 may rely on multiple interventions, but more data is needed. Obtaining a more complete representation of this catch-up group (women between the ages 18-26) would provide insight into their demographics and vaccination rates. Approximately 12,000 women are diagnosed with cervical cancer in the United States annually (CDC, Cervical Cancer Fact Sheet, 2012). Along with Pap smear screening, the HPV vaccine clearly could decrease the incidence of future cervical cancer in women currently 18-26 years old. Factors that influence vaccination rates, such as STD information-gathering behavior, number of sexual partners, and multiple demographic variables can be investigated by using a large national database that includes questions regarding HPV vaccination. Policy makers will be exploring strategies and implementing programs under the Affordable Care Act (2010) that expand preventive services in community and clinical settings which will hopefully decreasing disparities in health care. The medical home model, coordinated and complete, medical care is currently being explored as an avenue to increase quality comprehensive care (Patient Centered Homes, Health Affairs, 2010). Research addressing barriers to preventive care may be of use when crafting strategies in increase HPV vaccination rates.

Policies concerning promotion of HPV vaccination in specific age groups, including college age women, could result in prevention monies being spent in a targeted manner.
Predicting the long term effectiveness of the vaccine, whether a vaccine booster will be needed, for instance, is still debatable; this adds to the deficiencies of a solely cost/benefit analysis (Goldie, et al., 2003). Increasing HPV vaccination and continued cervical cancer screening with Pap smears could lead to decreased mortality due to cervical cancer (Dempsey, et al., 2008, Goldie, et al., 2003,). Gathering mortality rates in currently vaccinated adolescents and women in the “catch-up” group could take a decade or more.

Exploring barriers to HPV vaccination can aid policy makers in making more informed decisions about how health promotion monies are to be spent and/or vaccination programs are to be implemented. Medicare and Medicaid as well as most private insurances cover the cost of the vaccine series. Despite this, barriers to vaccination exist. The average knowledge of HPV is still considered low among college age women (Hall, et al., 2008, Lenselink, et al., 2008, Philips, et al., 2003).

Current studies point to a general lack of knowledge regarding HPV, but these previous studies are concentrated in single-institution student or limited populations. There is limited research into the success rates of programs that use education to increase HPV vaccination rates in college women. The greatest benefit for women is to receive HPV vaccinations before their first sexual encounter. However, without targeting specific barriers and increasing vaccination rates, no benefit will be realized. Policy makers may need direction when making decisions regarding HPV vaccination in the “catch-up” group due to their specific barriers. The goal of this study is to illuminate some potential barriers to HPV vaccination in college age women.
Methods

This summary contains the research problem, research question, research design, and population of interest, source of data, survey instrument, dependent and independent variables, and method of analyses.

Research Problem

The HPV vaccine has the potential to further decrease the development of cervical cancer in women between the ages of 18-26. This group of women may suffer disproportionately from cervical cancer compared to adolescent girls who received the vaccine. For health policy makers there is a need to identify potential barriers, including demographic barriers, to vaccination if increased HPV vaccination in women age 18-26 is desired.

Research Question

Within the parameters of data from the American College Health Association-National College Health Assessment, what factors can be identified that affect HPV vaccination rates in college women 18-26 years old?

Null Hypotheses

1. \( H_0 \): There is no difference in demographic characteristics between women who receive the HPV vaccine and those who do not.

2. \( H_0 \): There is no difference in HPV vaccination rates between college women who receive information regarding STDs and those who do not.

3. \( H_0 \): There is no difference in HPV vaccination rates in college women who receive yearly gynecological exams and those who do not.

4. \( H_0 \): There is no difference in HPV vaccination rates among college women who receive the Hepatitis B vaccine(s) and those who do not.
5. \( H_0 \): There is no difference in HPV vaccination rates among college women who receive the influenza vaccine and those who do not.

6. \( H_0 \): There is no difference in HPV vaccination rates of college women who have insurance and those who do not.

7. \( H_0 \): There is no difference in HPV vaccination rates in women who have multiple sexual partners and those who do not.

8. \( H_0 \): There is no difference in the likelihood of HPV vaccination amongst the predictor variables in the binary logistic regression.

Available data to be analyzed

A secondary analysis of the American College Health Association (ACHA) National College Health Assessment (NCHAII) will be conducted, with emphasis on questions dealing with demographics, HPV vaccination, STD information gathering, gynecological exams, Hepatitis B and influenza vaccination rates, and sexual behavior. The sample size for the analysis is 68,193.

The National College Health Assessment (NCHA), designed and distributed by the American College Health Association, is a national survey that has been used by 587 higher education institutions as of fall 2011. This comprehensive survey includes questions that track health issues and safety trends. Alcohol, tobacco, and drug use and frequency, sexual health, weight issues, nutrition and exercise habits, mental health issues, personal safety, and preventive health are among the research questions focused on by the survey. This survey was first conducted in 28 institutions in the spring of 2000. A revised survey was used in 2008 that includes a question asking whether respondents have received the HPV vaccine, and that revised survey is currently in distribution. This survey provides a large sample of women with mixed demographic characteristics, and extensive demographic information, such as age, race, insurance status, years
of higher education, grade point average, is collected. Information and survey questions regarding sexual behaviors, receiving information regarding STD’s, gynecological exam history, and vaccination history (including the HPV vaccination), and a question regarding health insurance status, could all be used in statistical analysis. Using logistic regression to establish what variables influence HPV vaccination rates can discern and identify potential barriers to HPV vaccination.

For the NCHA, students at each institution are randomly selected by classrooms. All surveys are anonymous or confidential; no identifiable information is collected. The survey takes an average of 30 minutes to complete and the depth of the survey is extensive. The survey can be paper-based or web-based. General demographic and health questions, including vaccinations, along with a wide range of questions that assess the student’s alcohol, tobacco, and drug use, sexual health and safety, weight management and nutrition, violent encounters and personal safety, and mental health, are asked in a scaled format. All surveys are kept confidential; the descriptive data is given to each educational institution, and data is compiled by the American College Health Association to obtain descriptive statistics for all participating. The surveyors acknowledge that the information is not to be generalized to all universities since universities are self-selected. This survey is administered once a year at the participating institutions in the fall or the spring semester based on the colleges’ preference. The survey’s reliability and validity were evaluated through a series of comparisons and statistical analysis based on past surveys, such as the Harvard School of Public Health’s 1999 Alcohol Study and the CDC’s National College Health Risk Behavior Survey. The outcomes of those evaluations were published by the American College Health Association (2013).
The National College Health Assessment II (NCHAII) was a revision of the previous survey that had collected 832 institutional data sets from 2000 through the spring of 2008. The survey was revised, in the fall of 2008, to include questions on HPV, the flu vaccine, and mental health. Since fall 2008, 565 institutional data sets have been collected. The secondary data analysis for this research will use the data from 2008 (fall), 2009 (spring and fall), and 2010 (fall), 253 institutions contributed. The data sets from spring 2010 and years 2011 and 2012 are not available for use in outside research. This study will be selective with the questions used in the secondary data analysis; questions directly and indirectly related to HPV will be the focus of the analysis.

Along with descriptive statistics, correlation analysis, and binary logistic regression was employed, the dependent variable being HPV vaccination, which was dichotomous. Descriptive statistics and chi-square tests were employed to explore associations between the dependent and the independent variables: race, geographic location, receiving STD information, having a gynecological exam in the past 12 months, receiving the Hepatitis B and influenza vaccine, and primary source of health insurance. Independent variables used in the binary logistic analysis were: race, geographic location, receiving STD information, having a gynecological exam in the past 12 months, receiving Hepatitis B, receiving influenza vaccine, and primary source of health insurance, age, and number of sexual partners in the past 12 months. The following variables were reported by race and geographic location: HPV vaccination, receiving STD information from the respondents’ college/university, having a gynecological exam in the last 12 months, and source of health insurance.

Binary logistic regression was an appropriate statistical tool for this analysis since the dependent variable; HPV vaccination was dichotomous (yes/no). The following independent
variables were categorical: race, geographic location, receiving STD information from the respondents’ college/university, having a gynecological exam in the past 12 months, receiving Hepatitis B vaccination, receiving influenza vaccination, and primary source of insurance. Continuous independent variables include age and number of sexual partners. IBM SPSS Statistic 20 computer software was used to complete the data analysis.

Summary of findings

It was demonstrated that White/non-Hispanic women had a higher rate of HPV vaccination compared to minorities (Black/non-Hispanic, Hispanic/Latino, Asian/Pacific Islander, American Indian/Alaskan Native/Native Hawaiian, and “other”). The racial category Biracial/Multiracial was not significant in the binary logistic regression, most likely due to the small sample size. HPV vaccination rates within racial categories are shown in Figure 1.1.

Figure 1.1 Percentages of women who received the HPV vaccine within racial categories
The binary logistic regression showed that minority women (Black/non-Hispanic, Hispanic/Latino, Asian/Pacific Islanders, American Indian/Alaskan Natives/Native Hawaiians, and “other”) had a decreased likelihood of receiving the HPV vaccine compared to White/non-Hispanic women ($p=.000$). Table 1.1 demonstrates the odds-ratios and 95% confidence intervals of statistically significant minority categories when compared to White/non-Hispanic women.

Table 1.2 Odds-ratios and 95% confidence intervals of racial categories that were statistically significant in the binary logistic regression

<table>
<thead>
<tr>
<th></th>
<th>Odds-ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>White/non-Hispanic (ref)*</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Black/non-Hispanic</td>
<td>0.744</td>
<td>0.692</td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>0.903</td>
<td>0.840</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>0.795</td>
<td>0.746</td>
</tr>
<tr>
<td>American Indian/Alaskan Native/Native Hawaiian</td>
<td>0.852</td>
<td>0.730</td>
</tr>
<tr>
<td>Other</td>
<td>0.642</td>
<td>0.551</td>
</tr>
</tbody>
</table>

*Reference group (ref)

White/non-Hispanic women had the highest rate of receiving a gynecological exam in the past twelve months (58). Black/non-Hispanic women and American Indian/Alaskan Native/Native Hawaiian had gynecological exam rates of 53% and 54%, respectively. Hispanic/Latino had a gynecological exam rate of 44% while the racial category with the lowest gynecological exam rate, 28%, was seen in Asian/Pacific Islanders. Fifty five percent of women who received a gynecological exam in the past 12 months also received the HPV vaccine and 43% of women who did not receive a gynecological exam received the HPV vaccine.
Furthermore, it was shown in the binary logistic regression that receiving a gynecological exam in the past 12 months increased the likelihood of receiving the HPV vaccine by nearly two fold ($OR=1.939$, $95\% \ CI=1.868-2.007$).

In addition, the binary logistic regression demonstrated that receiving the Hepatitis B and influenza vaccines were statistically significant ($p=.000$) for increasing the likelihood of receiving the HPV vaccine ($OR=4.1$, $95\% \ CI=3.796-4.428$ and $OR=2.55$, $95\% \ CI=2.465-2.643$ respectively). White/non-Hispanic women received the Hepatitis B vaccine at a rate of 93%, which is the highest percentage within the racial categories. Asian/Pacific Islanders’ had the lowest rate (85%) of receiving the Hepatitis B vaccine. It was expected that Hepatitis B vaccination rates would be high, since it is commonly a requirement for college matriculation. Influenza vaccination rates were considerably lower since it is voluntary to receive the vaccine. In fact, only 37% (Range 36%-38%) of the women in this study received vaccination for influenza. It is interesting to note that 64% of women who received the influenza vaccine also received the HPV vaccine.

Source of health insurance (college/university plan, parents’ plan, another plan, and no insurance) was statistically significant in the binary regression model ($p=.001$) when predicting HPV vaccination. It was determined that 28% of students in the analysis were lacking a source of health insurance. Seventy-two percent of women reported having a source of health insurance, with the majority of these women (75%) being covered by their parents’ insurance. Comparing HPV vaccination rates and source of health insurance, it was shown that 54% of women who were covered by their parents’ insurance received the HPV vaccine. Conversely, only 28% of women who had no health insurance received the vaccine. The binary logistic
regression demonstrated that having parental insurance coverage increased the likelihood of receiving the HPV vaccine by nearly two fold ($OR=1.845$, $95\% \ CI=1.689\text{-}2.016$).

Age and number of sexual partners were also statistically significant in the binary regression model ($p=.000$). As age increased, the likelihood of receiving the HPV vaccine decreased, which is most likely due to the fact that women over the age of 19 may not have been exposed to HPV vaccination recommendations as adolescents. As the number of sexual partners increased, so did the likelihood of receiving the HPV vaccine. Receiving STD information from one’s college/university also proved to be statistically significant in the regression analysis ($p=.005$). There was an increase in the likelihood of receiving the HPV vaccine when receiving STD information ($OR=1.05$, $95\% \ CI=1.01\text{-}1.086$).

The geographic region with the highest HPV vaccination rate was the Northeast (55%). The Southern region had a HPV vaccination rate of 49%, followed by the Midwest and Western region (45%). Differences in HPV vaccination rates between geographic regions was shown to be statistically significant ($p=.000$) which is not surprising given the large sample size. Women in the Midwest reported the highest rate of receiving a gynecological exam in the past 12 months (60%). Northeast region women had the highest rate of receiving the Hepatitis B (93%) and influenza vaccine (40%), and the highest percentage of health insurance coverage (98%). In the binary logistic regression, women living in the Midwestern, Southern, and Western regions all had a lower likelihood of receiving the HPV vaccine compared to those in the Northeast region.

The large sample size ($N=68,193$) provided by the ACHA-NCHA allowed for the examination of several potential barriers to HPV vaccination. The chi-square analysis demonstrated that there were statistically significant ($p=.000$) differences in HPV vaccination rates between racial categories and geographic regions. The chi-square analysis also
demonstrated that there were statistically significant differences \( (p=0.000) \) in HPV vaccination rates between women who did and did not have the Hepatitis B and influenza vaccine, and those who did and did not have a source of health insurance. The results of the chi-square analysis were not surprising due to the large sample size \( (N=68,193) \). The findings of the binary logistic regression call for the rejection of the null hypotheses. The low pseudo-\( R^2 = 0.156 \) was most likely due to the fact that there was a limited number of barriers included in the analysis. This study could not determine perceived risk, perceived susceptibility, perceived benefits and cues to action, which are arguably factors in deciding whether to engage in preventive health behaviors (Brewer, et al., 2007, Nadarzynski, et al., 2012, McAlearney, et al., 2010).

Discussion

The CDC recommends HPV vaccination for women ages 18-26. The vaccine may offer the benefit of decreased cervical cancer rates in women even after they have engaged in sexual activity (Harper, et al., 2004, Goldie, et al., 2011). White/non-Hispanic women in the analysis had the highest rate of HPV vaccination rates and the lowest rate of cervical cancer in the United States when compared to other races (NIH, SEER Data, 2012). Gynecological exams often include Pap testing. Minority women in this analysis demonstrated lower gynecological exam rates compared to White/non-Hispanic women. In previous studies, it was shown that being a member of a minority group was considered a barrier to HPV vaccination (Bendik, et al., 2011, Kessels, et al., 2012, Licht, et al., 2010). Licht et al (2010) determined that Black and Asian women were less likely to receive the HPV vaccine when compared to white women, which is consistent with this analysis.

Increasing the rate of gynecological exams could be not only an avenue for Pap testing but also for HPV vaccination recommendation: 55% of women in the analysis who had a
gynecological exam in the past 12 months received the HPV vaccine, while 43% of women received the HPV vaccine when they did not have a gynecological exam in the past 12 months. The CDC (2008) reported that white women had a higher rate of gynecological exams, which is consistent with this study.

Provider recommendation had shown to increase the likelihood of receiving the HPV vaccine (Brewer, et al., 2007, Colgrove, 2006, Herzog, et al., 2008, Keating, et al., 2008, Kessels, et al., 2012, Marchand, et al., 2012, Rosenthal, et al., 2011). When women are in contact with health care providers, information regarding the benefits of preventive care can be obtained. Physicians face barriers to recommendation of the HPV vaccine, such as low reimbursement rates (Keating, et al., 2008). Promoting preventive care for college women can also include education regarding the benefits of the HPV vaccine. Health care providers are an important source of education regarding the HPV vaccine. Research needs to be expanded regarding HPV vaccine recommendation among health care providers. The new recommendation that women receive a Pap smear at 21, or three years after engaging in sexual intercourse, may influence gynecological exam rates, which has to be determined by future research.

Women who received the Hepatitis B and influenza vaccine were more likely to receive the HPV vaccine. Hepatitis B is often required for college matriculation, so it is not surprising that 92% of respondents received the vaccine. What is interesting to note is that only 17% of women who did not receive the Hepatitis B vaccine received the HPV vaccine. 64% of women who received the influenza vaccine also received the HPV vaccine.

Women who had a source of health insurance were also more likely to receive HPV vaccine. Respondents who reported that they were covered by parental insurance were almost twice as likely to receive the HPV vaccine when compared to women who lacked insurance, as
determined by the binary logistic regression ($OR=1.845$, $95\% \text{ CI}=1.689\text{-}2.016$). Lower socioeconomic status has been associated with lacking health insurance (Kahn, et al., 2008, Rodrigues, et al., 2005, Solomon, et al., 2007, Swan, et al., 2003). The CDC (2009) also reported that insurance coverage is linked to increased gynecological exam rates. In this analysis it was not possible to determine the students’ or parents income range, this is a limitation of this analysis.

Age and number of sexual partners were statistically significant in the binary logistic regression ($p=.000$). As women aged their likelihood of receiving the HPV vaccine decreased. This is most likely due to lack of exposure to the HPV vaccination recommendation. The recommendation came to fruition in 2006; however, women who are over the age of 19 in the survey were past the target age of 11-12 at that time. It was also determined that an increase in the number of sexual partners increased the likelihood of receiving the HPV vaccine. There may be a misconception that it is best to get the vaccine after engaging in intercourse; in fact, the opposite is true. Future research could be conducted to gain insight into when college women believe that they should receive the HPV vaccine.

In the analysis receiving STD information increased the likelihood of getting the HPV vaccine ($OR=1.05$, $95\% \text{ CI}=1.01\text{-}1.086$). This was found to be statistically significant as well ($p=.005$). The chi-square analysis determined a statistical significance in the HPV vaccination rates of those who did and did not receive STD information. There was no way to evaluate the STD information gained by the respondents, which is a limitation of the study. Past study authors point to the need for tailored educational materials regarding the HPV virus and vaccine (D’Urso, et al., 2007, Jones, et al., 2008, Kahn, et al., 2007, Parson, et al., 2000, Yacobi, et al., 1999). Lacking knowledge concerning the HPV virus and vaccine is a barrier to vaccination
(Blumenthal, et al., 2008, Brewer, et al., 2007, Rosenthal et al., 2011). Racially specific educational materials could be viewed as practical in reducing the knowledge barrier. Bendik, et al (2011) determined that HPV knowledge was an influencing factor in receiving the HPV vaccine. Increased research regarding HPV education in college age women is warranted.

**Strengths of the analysis**

The greatest strength of this analysis is the large sample size afforded by the ACHA-NCHA (\(N=68,193\)). Most current studies which evaluated HPV vaccination in college women had to rely on small sample sizes (Caron, et al., 2009, Caskey, et al., 2009, D’Urso, et al., 2007, Kahn, et al., 2007, Licht, et al., 2010, Marchand, et al., 2012). Unprompted knowledge concerning the rate at which college women receive STD information from their universities has not been explored. Data regarding gynecological exams in the past 12 months was useful in comparing HPV vaccination rates; both Pap smears and HPV vaccination aim to reduce cervical cancer rates. Comparing HPV vaccination rates and Hepatitis B and influenza vaccination is novel. Hepatitis B is a mandatory vaccine. The influenza vaccine is voluntary as is the HPV vaccine.

**Limitations of the analysis**

This analysis relies on self-reporting. Limitations regarding self-reporting should be acknowledged; response bias (the tendency to answer questions a specific way regardless of the truth), lack of introspective ability of respondents, intentionally answering question inaccurately, and the tendency of respondents to answer in a socially acceptable manner when asked sensitive questions, such as “how many sexual partners have you had in the past 12 months.” Respondents could also place themselves in multiple racial categories, eliminating the possibility of mutually exclusive designations, which is highly desired in epidemiological studies. The analysis should
not be generalized to all college age women, since the colleges/universities that participated in the survey are self-selected.

There was no way to determine if the respondents received the full HPV vaccination series; it can only be assumed that the respondents received one dose of the vaccine series. There is no way to determine the content of the STD information received by the respondents.
The geographic regions in the study were limited to the four board categories defined by United States Census Bureau. It would have been helpful to further divide regions of the United States by state and rural and urban regions.

Conclusion

College age women between the ages to 18 to 26 are defined as a “catch-up” group when targeting those that could benefit from the HPV vaccine. Some pediatricians are currently advising parents of preadolescent and adolescent girls about the risks and benefits of receiving the HPV vaccine. This targeting pattern is most likely due to the increased probability of sexual encounters as girls reach their late teens. What is unclear is if women in the “catch-up” receive HPV vaccine recommendations. While the HPV vaccine is best given before a girl’s first sexual intercourse, there is a group of college age women that could benefit from the protection of the vaccine.

There is limited research regarding college women and HPV vaccination. Most research that has been done is on small populations in homogeneous college settings, or in single institutional settings. This limited research, however, does point to a lack of general knowledge and a deficiency in vaccination rates in college women. Examination of the variables that empower or hinder these young women is warranted. Students of different racial background may experience different barriers to HPV vaccination. As universities consider funding they
need to justify the dollars spent on health education and services. Physician and other health providers could also find that understanding the barriers to HPV vaccination for college women may be appropriate when promoting the vaccine.

The Affordable Care Act (2010) not only aims to increase insurance coverage rates, but specifically to decrease in health disparities in minorities. Understanding HPV vaccination barriers in minorities could aid in the targeted health promotion. The possible creation of a “medical home” for coordinated centralized care is a potential care model that is being explored to increase adult vaccination in the United States. Currently women ages 18-26 may not have been exposed to the HPV vaccination recommendation. There is the potential that women in the catch-up group may suffer disproportionately from cervical cancer. This research could increase the knowledge base concerning HPV vaccination rates and certain health behaviors of college women.
Chapter 2
Literature Review

Introduction

Human Papillomavirus

The Human Papillomavirus (HPV) is the most common sexually transmitted disease in the United States. Like the flu virus, HPV actually describes a group of more than 150 related viruses. Forty of the HPV viruses are spread by direct skin-to-skin contact, such as vaginal, anal and/or oral intercourse. The virus enters the body through the epidermis, usually through a tear; then epithelial cells are invaded and the virus develops proteins in cells which interfere with normal cell growth, which ultimately can lead to the development of cancer. Condoms cannot completely provide protection against HPV since skin-to-skin contact is still present, and other forms of birth control, save abstinence, are not effective. HPV’s that are sexually transmitted are placed into two categories, low risk and high risk. HPV types 6 and 11 are examples of the low-risk category; these types are responsible for genital and/or anal warts. The HPV in the high-risk group are types 16 and 18, which are responsible for the majority of cervical cancers; type 16 is responsible for some oropharyngeal cancers. The National Cancer Institute reports that 42.5% of women have been exposed to the HPV strains that lead to genital infections and that 7% of adults have oral HPV infections. While women suffer from cervical cancer, men are more susceptible to HPV oral infection (CDC, Cervical Cancer Fact Sheet, 2012, National Cancer Institute, Cervical Cancer Fact Sheet, 2012, Dunne, et al., 2007). See Table 1 for common HPV types, the corresponding disease, and signs /symptoms.
Table 2.1:

*Common HPV types: disease and signs/symptoms*

<table>
<thead>
<tr>
<th>HPV Virus Type</th>
<th>Disease</th>
<th>Signs and Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>2, 7</td>
<td>common warts</td>
<td>Bumps on fingers and hands</td>
</tr>
<tr>
<td>1,2,4,63</td>
<td>Plantar Warts</td>
<td>Raised cauliflower bumps that occur on the soles of the feet. These lesions may bleed.</td>
</tr>
<tr>
<td>3,10,8</td>
<td>Flat warts</td>
<td>Flat lesions that may occur on knees, elbows, wrists, hands, and the face and neck.</td>
</tr>
<tr>
<td>6,11,42,44</td>
<td>Anogenital warts</td>
<td>Flat or cauliflower lesions that appear on the valve, vagina, cervix, anus, penis, and/or scrotum.</td>
</tr>
<tr>
<td>6,16,18,31,53,58</td>
<td>Anal lesions</td>
<td>Lesions that occur near or around the anus.</td>
</tr>
<tr>
<td>16,18,26,31,33,35,39,45,51,52,53,56,58,59,66,68,73,82</td>
<td>Genital Cancers</td>
<td>Pre-cancerous and cancerous formation in the genital area; visible lesions are often observed. This includes cervical cancer.</td>
</tr>
<tr>
<td>13,32</td>
<td>Focal epithelial hyperplasia</td>
<td>Pre-cancerous lesions that are found on the lips, cheeks, sides of the tongue. The lesions are often flat and asymptomatic.</td>
</tr>
<tr>
<td>6,7,11,16,32</td>
<td>Oral papillomas</td>
<td>Benign lesions that may appear on the lips, inside of cheeks, and/or tongue.</td>
</tr>
<tr>
<td>16</td>
<td>Oropharyngeal Cancer</td>
<td>Cancerous lesions that may appear on the base of the tongue, tonsils, soft palate, and/or pharynx</td>
</tr>
<tr>
<td>6,11</td>
<td>Laryngeal papillomatosis</td>
<td>Benign lesions that appear on the larynx that can cause loss of voice and difficulty breathing.</td>
</tr>
</tbody>
</table>

*Centers for Disease Control and Prevention, HPV type, 2012*
HPV infection is difficult to detect since the majority of infections are asymptomatic. Infections are often transient, resolving in one to two years. Determination of cancer formation due to HPV is not possible since it is difficult to determine when the virus will or will not become transient. Predicting HPV infection, the progression or remission, proves to be difficult (Goldie, et al., 2003). Several factors increase the likelihood that the virus will cause genital warts or cancer. These factors include a weakened immune system, multiparity (having multiple children), long-term use of oral contraceptives, poor oral hygiene, smoking, and chronic inflammation. Treatment for HPV-induced cancer includes surgery (removal of pre-cancerous or cancerous lesions), chemotherapy for cancerous lesions that are at risk for dissemination, and radiation therapy for local control of cancerous lesions. The common treatment of genital warts includes surgery and/or topical drugs (CDC, Sexually Transmitted Diseases Treatment Guidelines, 2010).

Cervical cancer rates in the United States

In the United States, the CDC reported that in the time period 2004-2008, 11,967 women on average were diagnosed annually with HPV-associated cervical cancer and 4,008 women died. The CDC also reported that during the same era, 11,726 cases of HPV-associated oropharyngeal cancer were diagnosed annually, of which 9,356 were diagnosed in males. Cervical cancer rates (HPV and non-HPV associated) are higher among blacks (9.9%) and Hispanics (11.3) compared to whites (7.4%) and non-Hispanics (7.4%). This disparity is likely related to socioeconomic status and decreased access to screening and follow-up (Cervical Cancer Rates, 2012, Morbidity and Mortality Weekly Report, April 2012, Zambrana, et al., 1999). Cervical cancer rates are determined by the National Center for Health Statistics; the Comprehensive National Health Interview Survey is the non-institutional national survey that
was employed, and statistics were compiled by the Centers for Disease Control (Swan, et al., 2003, CDC, Cervical Cancer Rates, 2012, NIH, SEER Data, 2011).

According to the American Cancer Society (ACS) and the Surveillance Epidemiology and End Results (SEER), cervical cancer typically occurs in women between the ages of 35 to 55, with the median age at diagnosis being 48. Black and Hispanic women have a higher incidence rate compared to white women: 9.8 cases per 100,000 black women and 11.8 per 100,000 Hispanic women, compared to 8.0 per 100,000 for white women. Black and Hispanic women also have a higher mortality rate: 4.3 per 100,000 black women and 3.0 per 100,000 Hispanic women, compared to 2.2 per 100,000 white women (NIH, SEER Data, 2012). The high risk (oncogenic) strains of HPV (Types 16, 18, 31, 33, and 45) are responsible for about two-thirds of all cervical cancers in all races, with strains 16 and 18 being the most common. Currently, there is no cure or treatment for HPV infection. There is only treatment for health-related problems caused by HPV.

The 2003 Youth Risk Behavior Surveillance summary reported that 62.3% of females in the United States have had sexual intercourse by the time they graduate from high school (Cates, 2007), which indicated that possible HPV infection can occur at a early age. The National Health and Nutrition Examination Survey, which provided a representative sample of the United States, used self-collected vaginal swabs to conclude that HPV was prevalent in 26.8% of US females ages 14 to 59. The prevalence of HPV in women 20-24 years of age was 27.4% (Dunne, et al., 2007). The authors of the study “Prevalence of HPV Infection among Females in the United States” concluded that while HPV infection is widespread, the incidence of infection by HPV types (16/18) that are responsible for the development of cervical cancer is relatively low, at 1.5% (Dunne, et al., 2007).
Global cervical cancer rates

The World Health Organization (WHO) reports that internationally, cervical cancer rates remain high. Globally there are approximately 500,000 confirmed cases of cervical cancer and 275,000 deaths. Worldwide, cervical cancer is a leading cause of cancer-related mortality among women. In North America, cervical cancer is the 13th leading cause of cancer deaths; however, in developing regions such as Africa and Southeast Asia, cervical cancer is the second leading cause of cancer death among women (WHO, Global Cancer Statistics, 2010). East Africa has the highest rate of cervical cancer worldwide. Lack of patient screening in East Africa, due to lack of health delivery systems, health care workers, and limited health care budgets, is the major factor in the large number of cervical cancer deaths (Campos, et al., 2012, WHO, Global Cancer Statistics, 2010). Established screening practices and increased access to health care facilities have decreased the cervical cancer burden in the United States and other Western nations. The demographic group that has not experienced a decrease in cervical cancer rates is Hispanic women (Vizcaino, et al., 2000). The benefits of cervical cancer screening and HPV vaccination have not been realized in developing countries.

Screening practices in the United States for cervical cancer

In the United States screening for pre-cancerous and/or cancerous lesions of the cervix is done with the use of cervical cytology testing. This test is called the Papanicolaou test, which is commonly known as the Pap smear. A healthcare provider, commonly a gynecologist, family practitioner or advanced practice clinician, will introduce a speculum into the vagina to collect cells from the outer opening of the cervix. The collected cells are placed under a microscope to detect any pre-cancerous (cervical intraepithelial neoplasia) or cancerous lesions. The sensitivity rate for detecting high-grade cervical lesions is 60-80%, which has proved beneficial in detecting
cervical cancers (USPSTF, Screening for Cervical Cancer, 2012). The United States has decreased its cervical cancer rates by 80% since 1950, largely due to Pap smear testing (NIH, Cervical Cancer Facts, 2012). Until recently it was recommended that females obtain a yearly Pap smear after the initiation of sexual intercourse, regardless of age, or after the age of 18. As of March 2012 the screening guidelines for cervical cancer have changed (ASC, Cancer Screening Guidelines, 2012).

The United States Preventive Services Task Force (USPSTF), which is sponsored by the Agency for Healthcare Research and Quality (an independent task force comprised of experts who analyze scientific evidence to ensure that preventive services are effective), along with the American Cancer Society (ACS), the American Society for Colposcopy and Cervical Pathology, and the American Society for Clinical Pathology, released new screening guidelines. It is now recommended that women have their first Pap test at the age of 21 or three years after first intercourse. These new recommendations are due to the fact that HPV is often transient, if a woman in her 20’s is infected with HPV 16 or 18; there is a high likelihood that the infection will clear her body within two years. Cancerous lesions are extremely rare in women under the age of 40. The updated guidelines suggest that women 21-29 years receive the Pap test every 3 years; it is recommended that women 30-65 receive the Pap test every 3 years, or every 5 years if testing for HPV is negative (ASC, New Screening Guidelines for Cervical Cancer, 2012, Dunne, et al., 2007, Smith, et al., 2007, USPSTF, Screening for Cervical Cancer, 2012). The impact of these new guidelines could possibly result in decreased healthcare costs (Solomon, et al., 2007).

The CDC reports that Pap smear rates between the years 2000-2008 have fluctuated by race for women 18 and older. In 2000, 81.3% of white women received the test, and in 2008 that percentage fell to 74.9%. Black and Hispanic women showed the same trend. In 2000, 85.1% of
black women received a Pap test, while in 2008 only 80.1% did; 77% of Hispanic women had a Pap smear in the year 2000 and 75.4% in 2008 received the test. Asian women demonstrated the lowest percentage (65.6%) who received a Pap smear in 2008. The CDC also reported that the percentage of women who received the Pap test varied by educational level. In 2008, 82.6% women with some college received a Pap smear, while 69.5% of women with only a high school diploma, and 60.6% of women without a high school diploma, received a Pap smear. Age was also a factor in Pap testing; 81.8% of women age 18-44 compared to 78.8% of women age 45-64 years old opted to receive a Pap smear (CDC, Surveillance of health status in minority communities, 2009).

Survey studies have concluded that being a member of an ethnic minority and a lower socioeconomic status can lead to decreased cervical cancer screening rates (McAlearney, et al., 2010, Rodriques, et al., 2005, Solomon, et al., 2007, Swan, et al., 2003, Vanslyke, et al., 2008). Michael A. Rodriques, et al., in the 2005 study “Breast and Cervical Cancer Screening; Impact of Health Insurance Status, Ethnicity, and Nativity of Latinas,” demonstrated that lack of health insurance is a major determining factor in breast and cervical cancer screening rates. 1998 data from the California Women’s Health Survey determined that 9% of foreign-born Latinas and 7% of U.S.-born Latinas did not receive a Pap smear; the largest predictor found in a multiple regression analysis was lack of health insurance. Knowledge of HPV is increasing; however, Hispanic women had a lower knowledge rate (67.1% vs. 78.9%) than non-Hispanic women (Kobetz, et al., 2010). Additional barriers to screening include low socioeconomic status and education levels. For example, Appalachian Ohio had higher cervical cancer rates, 37% above the national average for white women (McAlearney, et al., 2010). Living in a non-urban area is also a contributing factor for lower Pap smear rates (Swann et al., 2003, McAlearney, et al.,
Overall, cervical cancer screening with the use of Pap smears has decreased cervical cancer rates in the United States by 70% since the 1930’s (ASC, New Screening Guidelines for Cervical Cancer, 2012, USPSTF, Screening for Cervical Cancer, 2012). The National Cancer Institute reported in 2005 that 47% of women over 18 were aware that HPV caused cervical cancer, and in 2007 the awareness grew to 78%. This increase in awareness may be contributed to increased media coverage of the vaccine and approval by the FDA.

Testing for HPV in Pap specimens is not routine. Cells gathered from the cervix can be tested for the presence of high risk HPV (16/18) deoxyribonucleic acid (DNA). The CDC only recommends this test for women over the age of 30 or for women over the age of 21 who had an abnormal Pap smear. The DNA test for HPV could become an adjuvant procedure for women who have had abnormal Pap smears in the past. There is no reliable blood test for HPV. The 2006 introduction of the HPV vaccine to prevention regimens may have the potential to further decrease cancer deaths (CDC, Cervical Cancer fact sheet, 2012).

**Human Papillomavirus vaccination**

The Federal Drug Administration currently has approved two vaccines, Gardasil® (Merck & Co.) and Cervarix ® (GlaxoSmithKline). Gardasil protects against HPV types 6, 11, 16, and 18, strains that are linked to both cancer formation and genital warts. Cervarix ® protects against HPV types 16, 18, 45 and 31 and offers protection against anal cancers. The vaccine is recommended for girls ages 9-26 and males ages 11-21, with routine vaccination for girls and boys aged 11-12. The FDA-approved regimen is three separate vaccinations over a three-month period (CDC, Cervical Cancer fact sheet, 2012, NIH, Cervical Cancer fact sheet, 2012). Reported side effects of the vaccines include pain, pruritus (itching), erythema (redness of the skin) and swelling at the injection site. There is insufficient evidence at this time to
Human Papillomavirus: Identifying Vaccination Rates, etc. Cohen, T.F.

determine if a booster will be needed at some period following the initial vaccination (CDC, Cervical Cancer Fact Sheet, 2012, Dempsey, et al., 2008, Goldie, et al., 2011, NIH, Cervical Cancer Fact Sheet, 2012). Multiple strains of HPV can co-exist and have a synergistic relationship. Vaccination may curb this synergist relationship. “Vaccination against multiple HPV types” used mathematical modeling to demonstrate that mass vaccination against the specific strains of the virus could lead to decreased coexisting HPV infections and future HPV infections (Elbasha, et al., 2005). Women and men could benefit from the HPV vaccine, as it offers not just protection against cervical cancer but also oropharyngeal, penile, and anal cancers (Kim, et al., 2008, NIH, Human Papillomavirus, 2012).

In 2011 28.1% of females between the ages of 13-17 received all three doses of the vaccine series; the uptake rate for the hepatitis B three-dose series is 92.3%. The target HPV vaccination rate stated in Health People 2020 is 80%. Adolescent females that live below the poverty line have a lower rate of vaccination series completion than those that are at or above the poverty line (CDC, Morbidity and Mortality Weekly Report, 2011). Increase in vaccination rates is often based on several factors. The systemic review “Factors associated with HPV vaccine uptake in teenage girls” demonstrated that having health insurance, receiving regular on-schedule vaccines, increased health provider visits, and positive parental attitudes regarding vaccination are all factors in uptake (Kessels, et al., 2012). It was also demonstrated that black females were less likely to receive the vaccination series. The authors discussed the need to create vaccination programs that focused on specific racial/cultural groups to lessen disparities (Kessels, et al., 2012).

The vaccine is also considered effective in women between the ages of 15-26. Harper, et al. (2004), conducted a randomized controlled trial in young women. They found that Gardasil®
was 95% effective in preventing HPV (16/18) infection in women that tested negative for HPV, had less than six sexual partners, and had a history of no abnormal Pap results. The authors felt that women could benefit from the HPV vaccine and that widespread use of the vaccine could decrease HPV rates worldwide (Harper, et al., 2004). Women who lack access to screening Pap smears could realize the greatest benefit from HPV vaccination. Lack of access to Pap screening is high among Hispanic women and those of lower socio-economic status, and the benefit of the HPV vaccination could drastically reduce cervical cancer rates (Brewer, et al., 2007). The transient and synergist nature of the virus makes it difficult to provide clear statistics on the protection rate of the vaccine in sexually active women (Elbasha, et al., 2005, Harper, et al., 2004).

In the 2009 national survey study “Knowledge and Early Adoption of the HPV Vaccine Among Girls and Young Women: Results of a National Survey” it was reported that 9% of women over the age of 18 received at least one dose of the HPV vaccine even though 86% of respondents had heard of the vaccine and 91% had heard of the virus. Forty one percent of the respondents had some college experience and 19% obtained a bachelor’s degree. Sixty four percent of the females between the ages of 18-26 were white, with the remainder being Hispanic or black, and the researchers found that race had no influence on vaccination status. The multivariate predictors for vaccination included having a regular healthcare provider and visiting a provider within 6 months (Caskey, et al., 2009). The results were similar in a systemic review compiled in 2007: vaccine acceptability was associated with physician recommendation, and race was not a variable in acceptability (Brewer, et al., 2007).

Race was a predictor for HPV knowledge, vaccine acceptability, and related beliefs among rural Southern women (Cates, et al., 2009). When controlling for income, age, and
location the interview study determined that blacks were less likely than whites to believe that HPV was a threat and they reported lower intentions to vaccinate their daughters. While this study was limited to a single state, they concluded that blacks were less knowledgeable concerning the benefits of the HPV vaccine (Cates, et al., 2009). Fazekas, et al. (2008), found that Southern black women had a higher intention to vaccinate their daughters when they were more knowledgeable about the HPV virus. The measures of this study included awareness, knowledge, attitudes regarding HPV and vaccine acceptability (Fazekas, et al., 2008).

HPV vaccine acceptance by parents and young women has been shown to be influenced by health provider recommendation. Providers are in turn more likely to recommend the vaccine if their medical profession organization(s) recommend the vaccine, other barriers still exist including patient cost and physician reimbursement (Keating, et al., 2008, Zimet, 2006). A phone survey study by Keating, et al., focused on a geographic region which has a high cervical cancer rate. The researchers asked medical practices what their concerns were with offering the HPV vaccine; 68% responded that low reimbursement rates were the major concern. The overall cost of the vaccine series was a concern for 66% of the respondents; the average cost of the vaccine series is $320.00. The stocking of a vaccine upfront while waiting for private insurance reimbursement was the strongest physician barrier (Keating, et al., 2008).

Education regarding vaccines aimed at juveniles is commonly geared toward physicians and parents. The fact that the HPV infection is sexually transmitted complicates the willingness of some groups of parents to vaccinate their daughters and of physicians to engage in uncomfortable conversations with patients and/or parents (Kating, et al., 2008, Kessels, et al., 2012, Zimet, 2006). Politicians have found that mandating the HPV in adolescent females is not without controversy. Parental confidence in the vaccine varies; vaccine safety is a concern, as
well as the vaccine’s effect on the sexual behavior of vaccinated adolescent girls. Parental acceptance is based on many factors such as knowledge of the HPV virus, religious views, and physician recommendation (Colgrove, 2006, Herzog, et al., 2008, National Conference of State Legislatures, HPV vaccination, 2012). There is no research that links HPV vaccination and increased promiscuity in teenagers or young women.

In a 2005 study of over 600 pediatricians, Kahn and associates showed that HPV knowledge and attitudes about vaccination were predictors of intent to vaccinate. Although this study was done prior to the approval of Gardasil®, important information about pediatricians’ perceptions and attitudes was developed. Patients and parents rely on healthcare providers to advise them on health choices. When individuals are not in direct contact with health care providers, important information may be not be given to those that need it most. In the United Kingdom, research regarding public knowledge and attitudes about HPV has increased. Even though the vaccine was widely accepted in the UK, knowledge about the virus is minimal. A primary recommendation from the study “Public Knowledge and attitudes toward Human Papillomavirus (HPV) Vaccination” was that the Public Health Service in the UK should focus on education to address questions regarding side effects, efficacy, and cost (Walsh, et al., 2008). As the UK explores implementation of the HPV vaccine, there is the realization that implementation is complex and education of healthcare providers and the public is essential. The public health system in the UK has the resources to follow women for several decades to evaluate the efficacy of the vaccine. Cost as a barrier to vaccination in the UK exists, as the National Health Service does not cover the vaccination series for women over the age of 18 (Adams, et al., 2009, Raffle, 2007).
The United Kingdom and Australia have implemented comprehensive HPV vaccination schemes. Government-funded vaccination programs are not only for adolescent girls; the vaccine also is offered to the 18-26-year-old catch up group. In Australia 84% of 12-13-year-old girls and 52% of 20-26-year-old women have received the first dose of the HPV vaccine. In the United Kingdom the vaccine is part of the standard vaccination program for adolescent girls and 62% of 18-26-year-olds in the catch-up group are vaccinated (Gertig, et al., 2011). National health care programs have allowed the United Kingdom and Australia to maintain a National Vaccination Register, and develop large-scale vaccination strategies (Gertig, et al., 2011). Currently there is no adult vaccination register in the United States.

Public awareness of HPV and its links to cancer have been shown to increase uptake. Despite the HPV vaccine’s benefits, however, it is important to communicate that the vaccine does not provide 100% protection against cervical cancer (Brewer, 2007). If information regarding the HPV vaccine is not properly and accurately communicated, officials fear that the vaccine may be considered a safeguard to cervical cancer and the United States could see a decline in compliance with cervical cancer screening guidelines. Vaccination appears to provide nearly 100% protections against only five oncogenic types of HPV, as long as the individual is not already infected. According to Slomovitz and Bodurka (2007), organizations including the American Academy of Family Physicians and the American Academy of Pediatrics believed that mandating the vaccine was premature. Regardless of such opposition, and the trend in medicine to introduce highly specific treatments/vaccinations based on genetically encoded information, policy makers in the United States will need to be given relevant, accurate, and ethnically-sensitive information.
Strong endorsement from the medical community is needed to move forward with mass vaccination programs. In 2004, Raley, et al., demonstrated that endorsement by a professional organization, and reliable information that the vaccine would be successful, were major factors in physician recommendation practices. In a systemic review of 28 studies from 1995-2007 regarding HPV-related beliefs and vaccine acceptability, Brewer and Fazekas (2007) showed that in establishing vaccine programs importance should be placed on vaccine effectiveness, the likelihood of infection, physician recommendation, and barriers to implementation. The authors demonstrated that 42% of individuals were aware of HPV, 21% knew that the virus was common, 59% knew the purpose of Pap smears, and 68% knew that HPV is an STD. Limited knowledge of the virus may make it difficult to determine acceptability of the vaccine (Brewer, et al., 2007).

Health Belief Model

The Health Belief Model (HBM) was first described in the 1950s by Hochbaum, Rosenstock and Kegels. This social cognition model is often used to explain and predict health behaviors. The constructs of the model are: perceived susceptibility, perceived severity, perceived barriers, perceived benefits and cues to action. Human behavior and variability is complex and often subtle, and so constructs were developed to offer a tested approach to modify health behaviors (Becker, 1974). The challenge for government agencies that approve and license vaccines and the professionals who inoculate and educate the public is to convey accurate information and carefully construct a plan for appropriate dissemination of that information (Nadarzynski, et al., 2012). Providing information on only the risk of cervical cancer did not reduce cervical cancer risk perception. However, providing information regarding HPV as well as behavioral risk factors was more meaningful. In studies both in the United States and the
UK, it was shown that providing information on cervical cancer risk factors lowered women’s perceptions that they were at risk. This shows that certain forms of education can lower perceived risk, while including information regarding HPV increased perceived risk (Nadarzynski, et al., 2012, McAlearney, et al., 2010). Since the HPV vaccine has already been licensed, and in some states mandating the vaccine is debated, health professionals should understand the barriers that women 18-26 would face. The recommendation by the CDC that women 16-26 receive the vaccine is not the only factor that influences the decision-making process.

Addressing barriers to HPV vaccination can aid individuals in addressing their risk and realize the possible benefits. Offering free vaccination programs is often not enough. In 2011 Giambi, et al. evaluated a health program in Italy, and the major problem identified was maintaining contact with young women. Only 53% of women vaccinated in the program received all three doses of the vaccine. The authors concluded that they needed increased contact with young women, and a more efficient way to maintain contact to ensure the completion of the vaccine series (Giambi, et al., 2011). Public awareness of HPV may be a vehicle for increased HPV vaccination in the catch-up group: in a 2007 study of the awareness of the link between HPV and cervical cancer in the UK, only 2.5% of the survey respondents could indicate they knew of the link (Marlow, et al., 2007). Reaching women in the contact group and maintaining contact is necessary.

Kahn, et al. (2007), concluded that clinicians may be able to promote healthy reproductive behaviors while educating adolescent and young women about HPV and Pap test results. These authors explored educating young women based on the HBM, collecting information about perceived risks and threats as well as personal beliefs about personal
accountability. Interestingly, because this infection is transmitted sexually, it was anticipated that the shame and stigma caused by the disease would in turn lead to inappropriate self-care and follow-up. Kahn, et al. (2007), recommended that clinicians communicate accurate information based on an individual’s personal experiences. It was recommended that this information be delivered in a non-judgmental manner to reduce the stigma of contracting an STD (Kahn, et al., 2007).

Brewer and Fazekas (2007) reviewed fifty-three relevant articles focusing on the acceptability of the HPV vaccine among adolescents, young adults and parents of adolescents in the United States. As with any new vaccine or medical intervention, there must be awareness and knowledge of the issue. Within the HBM construct, perceived risks and effectiveness of the vaccine and the cues to action are important predictors of success. Perceived risk of HPV must include the close association of HPV with cervical cancer; personal risk plus severity of the virus may increase the perceived threat. If the risk of being infected with HPV is greater than the risk factors associated with actual vaccination, then the likelihood of accepting the vaccine is greater. Barriers to vaccination include cost, side effects, and safety. The vaccine’s cost is approximately $120 per shot, but it is available through Medicaid and many private insurance programs. The long term safety and efficacy of the vaccination has not been fully researched and consequently remains a concern among Americans (Garland, et al., 2007). Since HPV is a sexually transmitted infection, the issue of vaccination becomes more than just a medical issue. There is a concern among some parents that vaccination could promote adolescent sexual activity (Brewer, 2007). Since vaccination is recommended for girls as young as nine years old, the issue of the HPV vaccine is a highly charged topic with widely varied opinions. According to Charo (2007), many states are considering mandatory vaccination for school age children but are providing an option
for parents to decline based on religious or philosophical objections. Charo (2007) states that “in the case of HPV vaccine, parents’ belief that their children will remain abstinent (and therefore uninfected) until marriage renders it even more difficult to make the case for mandating a medical form of prevention.” Many consider HPV vaccine mandates as unwanted and an unnecessary intrusion on personal and parental rights; the statistics would argue, however, that abstinence-only approaches cannot be relied upon (Cates, 2009).

Kahn, et al. (2007), explored perceptions regarding abnormal Pap and HPV results. The authors followed a group of 100 sexually active females, aged 14 to 21 years, from an urban teen health center. This mixed-method study revealed a significant increase in HPV knowledge following a 20-minute standardized educational protocol. Through interviews, the authors explored the group’s perceptions of severity, susceptibility and beliefs about personal accountability. Interestingly, guilt was commonly mentioned when asked how they would feel if they were to test positive for HPV or have an abnormal Pap smear. There was discussion regarding anticipated shame and stigma associated with HPV. They described social isolation and rejection with words such as “dirty,” “nasty” or “promiscuous.” Educational programs geared toward young girls and women should carefully consider the anxiety and distress that may result from a positive Pap test. These psychosocial stressors may manifest themselves in shame or guilt, which may lead to inappropriate treatment and follow-up (Kahn et al., 2007).

Cues to action with respect to the HPV vaccine seem to be varied across socioeconomic status (SES) levels. Parents of lower SES are more willing to have their teen vaccinated. In a 2007, authors Slomovitz and Bodurka found in a small pilot study of 200 women that 77% would be willing to be vaccinated themselves, while only 67% would be willing to have their daughter vaccinated. Reasons for their hesitation included vaccine effectiveness and side effects.
Human Papillomavirus: Identifying Vaccination Rates, etc.  

Cohen, T.F.

Brewer and Fazekas (2007) noted that parents were more likely to accept the vaccination if it was physician recommended and a school requirement. Other potentially important factors regarding parents’ cues to action include the age of their child and awareness of sexual activity. Political and religious conservatives were also less likely to accept the HPV vaccine for their daughters (Brewer and Fazekas, 2007). Race is also a factor in awareness, knowledge, and beliefs related to HPV vaccination. In a rural Southern population, blacks reported a lower intention to vaccinate their daughters compared to white women in the same geographic location and SES; blacks were also more likely to believe that the vaccine was best delivered after the age of 17 (Cates, et al., 2009). Demographics and SES should be factors when designing education strategies for HPV vaccine delivery (Fazekas, et al., 2008).

According to Kahn, et al. (2005), parents rely on pediatricians to recommend vaccinations and other health interventions. The survey utilized in their study was based on the Theory of Planned Behavior, a model that has been used to predict physician behaviors. In particular, these behaviors include delivery and/or recommendation of immunization practices. The physicians were surveyed regarding knowledge of HPV and attitudes toward vaccination. It was found that knowledge regarding HPV, including vaccine safety and other characteristics, provides the pediatrician with important information that may impact his/her intention to administer the HPV vaccine. Another study (Keane, et al., 2005) dovetailed nicely with the aforementioned study, as it describes what has to occur for parents to understand and accept this vaccination. In contrast to the parents of the group of adolescents surveyed (Kahn, et al., 2005), the paper by Keane and associates placed more importance on vaccine safety, efficacy and cost. It clearly will take a “coming together” of the medical and public health communities as well as
parents to understand and take a proactive role in the health and safety of those children that are at risk for HPV and consequently, cervical cancer.

Social media also plays a role in the dissemination of HPV vaccine information. A 2010 Gardasil® commercial features young girls in a wide variety of activities proclaiming “One Less,” that is, one less cervical cancer case because they received the HPV vaccine. Presently, there are public service announcements advocating HPV vaccines but the frequency of airing and viewership is not known. Aside from these paid advertisements, information regarding the vaccination remains elusive unless an individual is uniquely interested. Information and misinformation abounds on the Internet and print materials, consumers must be careful of their sources when searching for information regarding the HPV virus (Brandt, et al., 2005). In a YouTube content analysis of information presented on HPV and cervical cancer, 75% was positive in nature but the majority was not professionally directed and additional information could have been presented (Ache, et al., 2008). In the mass media, important information regarding the virus is still missing, such as silent symptoms and how condoms do not guarantee protection against HPV infection (Kelly, et al., 2009). The media is a source of both positive and negative information and as a result, healthcare providers are still a vital source of information regarding HPV. Anti-vaccination web sites commonly communicate that vaccinations of various types cause illness, erode immunity, and are developed mainly for profit (Wolfe, et al., 2002). Social media can play either an informative role or a vehicle for misinformation.

Keane, et al. (2005), cited doctors, family/friends and nurses as the top three sources of credible information regarding vaccines. Parents were divided into groups based on their acceptance of vaccines (Vaccine believer, Cautious, Relaxed, and Unconvinced). Factors and
beliefs evaluated in the study included vaccine safety, vaccine recommendations, school requirements, disease protection, necessity of vaccines, relationship to child, role of government and trust in products. Keane concluded that customized communication has the best chance of success. Messages, educational materials and time spent with parents should be tailored to parents’ individual needs. Government and community agencies may accept these recommendations and develop tailored messages for each of the parent groups described in this study (Keane et al., 2005).

College women and HPV vaccination

The Health Belief Model (HBM) provides a reasonable model by which health educators and health care professionals can work to provide appropriate interventions and strategies for increasing the uptake of the HPV vaccine. The HBM and HPV screening with the Pap test in college women was explored by Burak, et al. (1997). The construct of the HBM explained only 15% of the variance in screening. However, their study showed that 80% of the participants believed that they were not susceptible to STD’s when, in fact, they were. This was a pilot study and the sample was small and homogeneous. Barriers examined included cost, pain, and embarrassment. Results showed that 99% of the participants believed that STD’s and cancer were serious, 52% had abnormal Pap smear tests, and 90% believed that gynecological exams are very important. The majority took cues to action from their mothers and only 32% had any knowledge of student health services; 16% were concerned that they were in danger of developing cervical cancer. There was a disconnection between the need for Pap smears and HPV susceptibility. Examination of each construct may allow health promoters to measure why individuals or groups of individuals elect to seek treatment or prevention (Burak, et al., 1997).
Larger sample sizes and expanded surveys may yield more information on the belief systems of different demographic groups.

The HPV vaccine is relatively new and researchers have been exploring knowledge, perceptions of the benefits, costs, and personal meaning in college age women (D’Urso, et al., 2007, Kahn, et al., 2007, Parsons, et al., 2000, Yacobi, et al., 1999). Kahn, et al., stated in their qualitative interview study that cognitive understanding of HPV influences behavior, as does understanding of Pap test results. Susceptibility to future HPV infection may be negatively influenced by a negative Pap smear and so a “my test is negative I do not need to worry” mentality may emerge. A negative Pap smear does not clear them of the future dangers due to HPV infection, but the sentiment may develop (Kahn, et al., 2007).

In the 2007 study “HPV Knowledge and Behaviors of Black College Students at a Historically Black University,” 64% of the 351-student sample had never heard of HPV and those that were aware of the virus gained their knowledge from a healthcare provider. Even those who had knowledge of HPV had many misconceptions: 36% believed that HPV caused Herpes and 65% believed HPV caused burning during urination (D’Urso, et al., 2007). When seven common STD’s -- HPV, HIV, Chlamydia, Gonorrhea, Herpes, Hepatitis B, and Syphilis -- were listed, the subjects knew the least about HPV (Yacobi, 1999). Lack of knowledge and misinformation is a common theme in current research. While many young women gather information from their mothers on gynecological issues, HPV is not entering the awareness of many college age women.

Conversely, a 2009 study done at a large state university in New Hampshire found that 85% of the 361-female sample knew what HPV was and 85% knew about Gardasil ® (Caron, et al., 2009). This study stands out as overwhelmingly positive. The data collection took place in
University Health Services; employees distributed surveys while female students waited for their appointments. Surveys also were given out in a health class, aerobics class, and choral rehearsal. Women taking part in this study may have been educated on HPV in their educational environments and women using health services may have been more aware than other students because they were more health conscious. However, it is worth noting that even though sexually active women in this study were aware of HPV, only 56.5% believed they were at risk of being infected by the virus (Caron, et al., 2009).

College-age men and their knowledge and perceptions of HPV have been the subject of very limited research. A small and homogeneous sample size was used at a university to demonstrate that men had little knowledge of HPV: 54.9% had not even heard of the virus. The 166 men in the sample, mostly white, did not perceive themselves at risk of HPV, even though the participants, who were knowledgeable, believed the infection was severe for women. The encouraging statistic in this study was that 95% of the men stated they would use a condom if they were diagnosed with HPV (McPartland, et al., 2005). While both female and male 20-year-olds may have knowledge of genital warts, the knowledge that HPV caused genital warts is lacking (Baer, et al., 2000). This limited research points to a greater need for education not only in women but also in male college-age groups.

Brief educational intervention has been shown to increase knowledge of HPV from 45% to 79% in a small sample of college women (Lambert, 2001). Again, there is no study that points to a common knowledge base in women, so one type of educational intervention may not be appropriate for all populations of women. Lambert was able to demonstrate that HIV knowledge outranks HPV knowledge even though HPV is the most common STD and can lead to lethal cancers. There is no link between high school graduation and high school location and
increased knowledge of HPV, which could point to a wide spread lack of emphasis on HPV education. HIV-specific education has been highly effective in informing individuals of their risks and changing their behaviors. Approaching HPV education in a similar manner may, in the future, yield similar results (Lambert, 2001, Yacobi, 1999).

HPV knowledge, perceptions, and motivation to receive the vaccination in college women were explored by Bendik, et al., 2011. Using an email survey in a large Southeastern university that employed knowledge and behavior items modeled after the National College Health Survey, the researchers determined that only 30.4% knew that HPV was the most common sexually transmitted disease, even though 40.4% of sexually active females, 39.1% of white students, 19.6% of black students, and 37.9% of Hispanic students received the HPV vaccine. Using a biserial analysis, significant factors in vaccination uptake were perceived: the importance of HPV, severity of cervical cancer, perceived likelihood of acquiring cervical cancer, knowledge of HPV, and increased number of sexual partners. Bendik, et al used their data to emphasize that educational intervention could be an avenue to increased HPV vaccination, as knowledge was an influencing factor in receiving the HPV vaccine. The authors stated that a limitation of the survey study was that 90% of respondents were white. A more heterogeneous population could be a focus of future research (Bendik, et al., 2011).

Kahn, et al. (2008) reported the rates of HPV infection in a population of low income women recruited from a teen health center and Department of Health clinic. Females (n=409), ages 13-26, completed a questionnaire regarding intention to receive the HPV vaccine series and their belief that they could receive the vaccine. Twenty-five percent of the sample was uninsured and 55% utilized Medicaid. Additionally, 100% of participants underwent HPV DNA testing. HPV vaccination history was gathered along with demographic information, gynecologic history,
insurance status, sexual behavior (number of partners and type of birth control used), and beliefs about HPV and vaccination. Constructs used in this study were based on the Theory of Planned Behavior, Social Cognitive Theory, and the Health Belief Model. Using summary statistics for HPV vaccination, demographics, attitudes, and HPV infection, it was reported that 5% had received one dose of the vaccine, 68% were infected with HPV (17% with type 16 and 12% with type 18). Sixty-six percent intended to receive the vaccine, 54% believed they could receive the entire three shot series, and 42% believed that they could afford the series. Factors found to be significant in the logistic regression included perceived severity of HPV, past STD history, and insurance coverage, all of which had a positive correlation. A limitation of this study was that the sample was limited to girls/women with self-reported previous sexual contact.

Caskey et al. (2009) utilized an existing national research panel to obtain 1,011 women ages 13-26 for analysis. This study used a survey to gather health characteristics that included healthcare utilization, tobacco use, sexual activity (number of sexual partners, age of first intercourse, and history of past STD’s), outcome of previous Pap smear tests, knowledge of HPV and its’ protective vaccination, and belief in condom use after vaccination. It was determined that 75% of the 599 women between the ages of 18 and 26 years of age had a regular health care provider. Ninety-one percent had heard of the HP virus, 86% heard of the HPV vaccination while only 9% had a least one dose of the vaccine. The researchers used multivariate logistic regression to examine predictors of HPV vaccination. Separate models were used for 13-17 year olds and 18-26 year olds. The women between the ages of 18 and 26 years of age that were most likely to receive at least one dose of the vaccine were the women that believed the vaccine protected against cervical cancer (84% vs. 54%) or those who accurately believed that condom use did not provide full protection against HPV (98% vs. 80%). Only 8% of respondents were
correct in their knowledge that a normal Pap smear does not mean the HPV infection is not present. Encouragingly, only 8% of women believed that the vaccine did not negate the need for Pap smears. Barriers to adoption of the vaccine included a lack of first sexual contact, cost, and having a regular healthcare provider, all of which were found to be statistically significant. There was no significant association found between races, income, or geographic regions of residence within the United States. Age and education were excluded due to collinear association. The researchers believed that even in the presence of risk factors along with correct beliefs regarding HPV, vaccine uptake are low. This leads them to point to increased education of both at risk women and health care providers as possible means to improve vaccine adoption and compliance.

In a survey study of 18-26 year old diverse community college students (n=178) in central Los Angeles, California researchers found that those who received the HPV vaccine were typically younger, had a health-related major, felt that the vaccine was safe, had lower perceptions that the HPV severity, and perceived that the vaccine was socially accepted (Marchand, et al., 2012). The survey instrument used by Marchand et al. (2012) was based on the Health Behavior Framework which affirms multiple influences on health behavior. Demographic information, HPV awareness and knowledge, perceived vulnerability, severity, vaccine awareness, beliefs, and vaccine uptake, social norms, provider recommendation, and health care satisfaction and trust, access to health care, sexual behavior, and finally mother-daughter communication were all evaluated in this study. The majority of the student population was Latino (59%) and African American (32%) and most had heard of HPV (80%) and the vaccine (70%). The vaccination rate for HPV was 25% among this sample. Controlling for demographic variables, the researchers performed a multivariate regression with perceived
severity, vaccination safety, and social approval. Doctor recommendations were excluded in the model, since 100% of the vaccinated women reported having a doctor’s recommendation. Those who rated HPV severity lower, vaccine safety high, and perceived higher social acceptability were more likely to receive the HPV vaccination. Marchand et al. (2012) cites national data suggesting the uptake of the HPV vaccine in Latina and Black women is lower than among white women, but with only two white women in the sample the researcher was unable to make that comparison. The authors stressed that provider recommendation was a strong factor in HPV vaccine uptake. As in previous research, emphasis on provider education was mentioned along with addressing an increase in education of college women that emphasizes vaccine safety, negative beliefs, and accurate information to increase vaccine uptake (Marchand, et al., 2012).

In the 2010 study by Licht et al the researchers used a descriptive analysis, including chi-square tests and multivariate logistic regression, to examine the relationship between the dependent variable of “HPV vaccination” and covariates. Demographics (age, university A and B, race, and religion) were explored to determine associations and vaccination rates. Knowledge items related to HPV and the HPV vaccination along with the perceived risk of acquiring or transmitting HPV were also placed in a multiple regression model. The sample was 406 female students between the ages of 18-26 recruited from two universities. Forty-three percent had at least one dose of the vaccine. Eighteen-year-olds were four times more likely to receive the vaccine compared to women 19 to 26 years old. Women who knew that HPV caused genital warts were almost twice as likely to receive the vaccine. White women (47.2%) were more likely to be vaccinated compared to black (26.3%) or Asian (28.6%) women. After adjusting for demographic characteristics, HPV knowledge and perceived risk scores were not predictive of HPV vaccination. It was interesting to note that the author suggested that the 18-year-olds were
more likely to receive the HPV vaccine since they had probable contact with a health care provider prior to college matriculation, because mandatory vaccinations are often required for college admissions. The need to address provider patient education as a vehicle for increased HPV vaccination uptake was emphasized (Licht, et al., 2010).

The American Public Health Association (2010) at an annual conference reported that 41% of college women were vaccinated for HPV. In addition to a lack of knowledge concerning HPV, vaccine safety, costs, and future toxicity are barriers to vaccination. Perceptions, beliefs and barriers have been explored in connection with HPV and its prevention (Hernandez, 2009). College women may also benefit from the HPV vaccine; HPV is a transient virus and it often clears the body within two years, so without target vaccination of these women its benefits may not be realized. College-age women are at the most risk for HPV exposure. Their lack of knowledge and low vaccination rates need to be explored in greater detail. Breaking down male and female populations by race and socioeconomic status would give even greater insight into the appropriate health promotion techniques needed (Caron, et al., 2009). Identifying specific groups of women and addressing their needs could allow for targeted health promotion activities.

Policy Implications

Cervical cancer screening with the Pap smear test reduces the death rate from cervical cancer nearly 80% in Western countries (CDC, 2008). There is the potential to further reduce the mortality rates of cervical cancer with mass vaccination for HPV. The vaccination of groups of women of lower socioeconomic status who are less likely to receive annual Pap smears would be beneficial if they receive the series before their first sexual contact. Women could benefit from education concerning the benefits of HPV vaccine. Education, either by healthcare providers or health promotion advocates, could result in decreased mortality from cervical
cancer. A prime example of the efficacy of this approach is the increased awareness, diagnosis, and decreased mortality from breast cancer due to education and overall public awareness (Daley, et al., 2012, Raffle, 2007).

College-age women are classified as a “catch up group” when it comes to HPV vaccination programs. Current and future HPV vaccination programs target preadolescent and adolescent girls while the 18- to 26-year-olds have the potential to be under-vaccinated and therefore suffer disproportionately from cervical cancer. Lack of knowledge regarding HPV and the consequences of infection affect the female college age population (Bandik, et al. 2011, Lambert, 2001, Yacobi, 1999, Kim, et al., 2008). College student health organizations traditionally have limited funding and have to be selective in their services and outreach programs. Future policy may dictate that preadolescent and adolescent girls’ parents are encouraged or mandated to have their daughters vaccinated for HPV. However, the college-age “catch up group” may need to be targeted. Since college-age women can independently make health care choices, they may need to be educated and encouraged to receive the HPV vaccine (Daley, et al., 2012, Kim, et al., 2008, Raffle, 2007).

The cost of HPV-related cancer is estimated at $4.6 billion a year, and $8 billion for HPV-related diseases. Uptake of the vaccine in the United States has been defined as less than optimal by the President’s Cancer Panel in 2012. Besides the positive impact on cervical cancer rates, oropharyngeal cancer could also be prevented in men. Australia has been able to elevate HPV vaccination rates by targeted programs, and a decreased incidence of genital wart cases has been reported (NIH, President’s Cancer Panel (HPV), 2012). There are differences in uptake among socioeconomic groups. Physicians can also be a barrier to HPV vaccination. It has been reported that some physicians are reluctant to discuss the uncomfortable subject of protection
from a sexually transmitted disease and some practices do not stock or offer the vaccine series due to lower reimbursements (Keating, et al., 2008).

The economic impact of HPV vaccination also has been investigated. In a 2008 study, researchers used epidemiological and demographic data to demonstrate the cost-effectiveness ratio of the HPV vaccine as compared with current Pap smear screening practices. This study was done with the assumption of permanent immunity. The researchers demonstrated the increased cost-effectiveness ratio for a 12-year-old girl was $43,600 per quality-adjusted life-year (QALY), with the ratio increasing to $120,000 per QALY for a 21-year-old. The dramatic increase in cost for the 21-year-old showed that it is less cost-effective to include an HPV vaccination program for these women compared to screening with Pap smears alone.

Government and private organizations may find that if a vaccination program limits the QALY to less than $50,000 it may be economically positive; but the dramatic increase in the ratio for the college-age group may be less desirable (Kim, et al., 2008). This limited study and other similar studies have not reached a consensus on the cost effectiveness of the HPV vaccine (Kim, et al., 2008). The measure of cost-effectiveness in college-age women may be difficult since there is a dramatic increase in the number of women who have had sexual intercourse, and baseline knowledge of these women’s sexual practices can be multi-factorial. Due to recently approved national legislation, Affordable Care Act 2010, mandating the availability of preventive medicine for all Americans, the HPV vaccine may be included in a preventive health formulary. Young women may find that the cost of HPV vaccination will be covered under the new legislation.

The Affordable Care Act, which was signed into law in March 2010 by President Barack Obama, has a goal of expanding preventive health services and reducing health disparities. The
development of the Community Preventive Services Task Force will make preventive health service a priority. Included in this is expanded care for women, including vaccination. The Act also includes increased funding to expand Public Health Services, and calls for the assembly of a non-profit Patient-centered Outcomes Research Institute, a non-profit agency which would focus on health outcomes and clinical effectiveness. A Task Force on Preventive Services and Community Preventive Services will aid in the development of prevention services that are recommended based on research evidence. HPV vaccination dissemination among the catch-up group of women needs to be explored; not only for vaccine effectiveness, but also for barriers women may face in obtaining the vaccination series.

It also is worth noting that the President’s Cancer Panel (2012) has singled out increasing HPV vaccination rates as a priority. The panel meets four times a year, as dictated by the Public Health Service Act, meetings are open to the public and findings are posted on the National Cancer Institute website. At a September 2012 meeting participants agreed that examination of the barriers to HPV vaccination was important to increase vaccine acceptability. Policies that determine price, access, and availability need to be created or changed, according to the panel. Other topics discussed in the panel were program initiatives, financing, development, and implementation, and lessons learned from other countries (NIH, The President’s Cancer Panel, 2012). The United States has an increasingly heterogeneous population, thus multiple strategies to increase HPV vaccination uptake may be needed. September 2012 HPV Committee meeting summery is available in the Appendix B.
Conclusion

HPV is the most common yet arguably the most overlooked STD. Genital warts are the most frequent symptom of HPV, but its worst outcome means that some infected women will develop cervical cancer later in life. The women at the greatest risk for HPV are in their early twenties; they are no longer completely guided by their parents when making health care choices and relying on them for knowledge may prove to be difficult. The use of Pap smears, long a part of women’s personal health routines, is accepted by college-age women, while the relatively more recent HPV vaccine is not as widely accepted. Both the Pap smear and the HPV vaccine serve to decrease the death rate due to cervical cancer. Pap smears can be utilized yearly to detect abnormal cells on the cervix; while the HPV vaccine is useful before HPV exposure, its protection rates following intercourse are not clear. The current generation of college women may not have been afforded the opportunity to receive the three-course vaccination series as minors. College age women are at risk of HPV because of increased sexual activity and the number of partners they have. HPV may affect women more adversely, but men transmit the virus and may benefit from targeted education.

Employing survey data from a database with a heterogeneous female college student population can be useful to explore the HPV vaccination rates and barriers to receiving the vaccine. Current studies point to a general lack of knowledge, but these previous studies are concentrated in homogeneous student populations. There is limited research into the success rates of programs that use education to increase HPV vaccination rates in college women, as well as whether these women seek out and/or are offered information regarding HPV vaccination. The greatest benefit for women is to receive HPV vaccinations before their first sexual encounter, but without targeted education and vaccination, no benefit will be realized. Policy
makers need direction when making policy and funding decisions regarding HPV education and vaccination.
Chapter 3

Methods

Introduction

This chapter includes the research problem, research question, hypotheses, research design, and population of interest (unit of analysis), source of data, survey instrument, dependent variable, independent variables, and data analysis.

Research Problem

The HPV vaccine has the potential to further decrease the development of cervical cancer in women between the ages of 18-26. This group of women may suffer disproportionately from cervical cancer compared to adolescent girls who received the vaccine. For health policy makers there is a need to identify potential barriers, including demographic barriers, to vaccination if increased HPV vaccination in women age 18-26 is desired.

Research Question

Within the parameters of data from the American College Health Association-National College Health Assessment, what factors can be identified that affect HPV vaccination rates in college women 18-26 years old?

Null Hypotheses

1. \( H_0 \): There is no difference in demographic characteristics between women who receive the HPV vaccine and those who do not.

2. \( H_0 \): There is no difference in HPV vaccination rates between college women who receive information regarding STDs and those who do not.

3. \( H_0 \): There is no difference in HPV vaccination rates in college women who receive yearly gynecological exams and those who do not.
4. H₀: There is no difference in HPV vaccination rates among college women who receive the Hepatitis B vaccine(s) and those who do not.

5. H₀: There is no difference in HPV vaccination rates among college women who receive the influenza vaccine and those who do not.

6. H₀: There is no difference in HPV vaccination rates of college women who have insurance and those who do not.

7. H₀: There is no difference in HPV vaccination rates in women who have multiple sexual partners and those who do not.

8. H₀: There is no difference in the likelihood of HPV vaccination amongst the predictor variables in the binary logistic regression.

Available data for analyses

A secondary analysis of American College Health Association’s (ACHA) National College Health Assessment (NCHAII) was done with emphasis on questions dealing with demographics, vaccination rates, healthcare behaviors, and STD information gathering of college women ages 18-26. The sample size for this analysis was 68,193 college women between the ages of 18-26. Women excluded from the analysis were those who did not identify race or identified more than one racial category.

Unit of Analysis

The unit of analysis was women enrolled in college between the ages 18-26. This population was subdivided by race. Women in this age group are classified as the “catch-up group” by the Centers for Disease Control with regards to the HPV vaccine. The women completed the survey in either the fall or spring 2008, fall or spring 2009, or fall 2010. Women who were not between the ages of 18-26 and those who did not identify their race, excluded their
race, or identified more than one racial category were disqualified from the analysis. The total of
number of participating institutions was 253. The National Center of Educational Statistics
reported that in 2010, 57-58% of college students were women. The percentage of college
women by race in the United States is approximately 72.9% white, 10.3% black, 8.8 Hispanic,
7.3% Asian and .8% American Indian (National Center for Educational Statistics, 2013).

Source of the National College Health Assessment

The American College Health Association (ACHA) is a non-profit organization founded
in 1920. The mission of the ACHA is to provide advocacy and leadership for college/university
health. The mission statement of ACHA is “The American College Health Association will
provide advocacy, education, communications, products, and services, as well as promote
research and culturally competent practices to enhance its members’ ability to advance the
health of all students and the campus community” (American College Health Association, 2013).

The ACHA membership comprises 800 institutions that are a mix of various sizes of 2-
and 4-year colleges that are either public or private. There are 2,800 individual memberships
that encompass a diverse collection of health care professionals that include physicians,
physician assistants, nurses, nurse practitioners, mental health providers, health educators,
dietitians, and pharmacists. Corporations and non-profit organizations connected to college
health are sustaining members. The development of the National College Health Assessment
survey by the ACHA provides members with information regarding health trends of college
campuses (American College Health Association, 2013).
Survey instrument

The American College Health Association-National College Health Assessment (ACHA-NCHA) is a national survey that has been used by 587 institutions of higher education since its inception in 2000. Students at each self-selected institution are randomly selected by classrooms. Individual colleges determine which classrooms will be selected and the percentage of students surveyed. The survey can be paper based or web based, according to the educational institution’s preference. No identifying information is gathered, surveys are completely voluntary and are anonymous, if paper-based, versus confidential if the surveys are web-based. Web-based surveys use a random number assignment to protect individual student identity and prevent multiple submissions. Results of the web-based surveys are not released to participating institutions until identifying emails are removed. Institutions are provided the results of surveys that pertain to only their college/university. The ACHA-NCHA publishes reference group executive summaries for spring and fall semesters based on year. Survey security is ensured by ACHA-NCHA via the use of a firewall and files are backed up every 24 hours. If participating institutions require National Institutes of Health (NIH) certificates of confidentiality then the institution must apply directly to the NIH. Paper based surveys have to be scanned into the ACHA-NCHA data base. Students can or cannot be offered incentives, according to the preference of the participating college (American College Health Association-National College Health Assessment, 2013).

Randomly selected students are sent a welcome letter inviting them to participate in the survey. Consent to participate in the survey is implied when the student opens the survey. E-mail lists are provided by participating colleges and the ACHA-NCHA randomly selects students
for participation. Individual institutions determine the best way to technically handle e-mail address access. Reminder e-mails letters are sent to non-responders. The ACHA-NCHA recommends that institutions send up to 3 reminder e-mails with each reminder sent every 4-7 days. Labeling of the reminder e-mails can include statements like “last chance”. The exact date that reminder e-mails are sent is coordinated with participating institutions. The ACHA-NCHA also recommends that the survey stay open for no more than 2 to 3 weeks. Colleges have to determine if Internal Review Board approval is needed (American College Health Association-National College Health Assessment, 2013).

The cost of the survey depends on the institution’s membership status with the ACHA. The approximate cost to member institutions is 20 cents per web-based survey and 40 cents per paper-based survey. For non-members the cost per survey was 40 cents per web-based survey and 75 cents per paper based surveys. Non-responder emails were 10 cents per reminder for members and 20 cents for non-members. There were additional costs associated with the addition of questions desired by specific institutions as well as specialized statistical analysis (ACHA-NCHA, 2013). An informational brochure is used to recruit institutional members and is included in Appendix C.

The 65-question survey takes an average of 30 minutes to complete and the depth of the survey is extensive. Demographic, preventive health questions (including vaccinations), along with a wide range of questions assessing alcohol, tobacco and drug use, sexual health and safety, weight management and nutrition, violent encounters and personal safety, and mental health of the students. The ACHA-NCHA codes completed surveys by geographic location. Geographic location is defined by the US Census Bureau (US Census Bureau, 2013). All surveys are kept confidential and the descriptive data is given to each educational institution. Data is then
compiled by the American College Health Association-National College Health Assessment to obtain descriptive statistics for all participating institutions. The surveyors acknowledge that the information is not to be generalized to all universities since universities are self-selected. This survey is administered once a year at the participating institutions in the fall or the spring semester based on the colleges’ preference (ACHA-NCHA, 2013).

The National College Health Assessment II (NCHAII) was a revision of the previous surveys and was used in 28 institutions from 2000 through the spring of 2008. The survey was revised in the fall of 2008 to include questions on HPV, the flu vaccine and mental health. The secondary analysis for this study will utilize data from the following semesters - 2008 (fall), 2009 (spring and fall), and 2010 (fall). The total number of institutions that participated in the survey is 253. The data from fall 2010 and years 2011 and 2012 are not available for outside research. Access was granted in December 2011 by the American College Health Association/National College Health Assessment for use in this dissertation, an approval letter and guidelines in Appendix D. This study will select questions used in the secondary data analysis that are directly and indirectly related to HPV vaccination.

Reliability and validity analysis

Reliability measurement in survey data ensures that there was consistency in the measures. Content and construct validity was essential to verify that the survey measures what was intended. The National College Health Analysis Survey was evaluated for reliability and validity by pilot testing and comparing survey items with previous national survey studies. The American College Health Association/National College Health Analysis pilot tested the initial survey from 1998 to 1999. National survey studies used for analysis included the National College Health 1995 Risk Behavior Survey (CDC), Harvard School of Public Health 1999

According to the ACHA-NCHA (2012) reliability was tested using Chronbach’s alpha with scores ranging from 0.4 to 0.9. When the National College Health Assessment was compared with the aforementioned national studies similar alpha coefficients were demonstrated across the data. Testing of the survey’s construct validity was done with Pearson correlations which indicated that the National College Health Assessment had construct validity. The measurement of validity was done using logistic regression with the main coefficient being the odds ratio. In comparison to the Harvard School of Public Health 1999 College Alcohol Study, the National College Health Assessment was found to have measurement validity (National College Health Assessment ACHA-NCHA Reliability and Validity Measures, 2013).

Data analysis

Descriptive, bivariate analysis, binary logistic regression was the method of analysis. Bivariate analysis was used to evaluate the relationship between variables. Predictor variables with statistically significant relationships with the dependent variable, HPV vaccination, were included in the logistic regression. Vaccine receipt is defined as those who received a least one dose of the vaccination series. Descriptive statistics was employed to characterize the sample as a whole and detect differences between those who have received the HPV vaccine and those who did not. Descriptive analysis reporting will be done by overall population, race and geographic location. Bivariate correlation was used to determine the relationships between the variables; a cut off of .7 was used. Chi-square analysis was utilized to compare means of the predictor variables race, geographic region, receiving STD information, receiving a gynecological exam in
the last 12 months, Hepatitis B vaccination, influenza vaccination, and primary source of health insurance with a statistical significance of $p<.05$. See table 2 listing reported rates.

Table 3.1
*Reported rates*

**HPV Vaccination Rates**\(^a\)
- HPV by race
- HPV vaccination by geographic location

**Healthcare behavior rates**\(^a\)
- Gynecological exam in the past 12 months by race
- Gynecological exam in the past 12 months by geographic location

- Hepatitis B vaccination by race
- Hepatitis B vaccination by geographic location

- Influenza vaccination by race
- Influenza vaccination by geographic location

- Health Insurance Status by race
- Health Insurance Status by geographic location

**Information gathering behaviors rates**\(^a\)
- Received Information Regarding Sexually Transmitted Disease by Race
- Received Information Regarding Sexually Transmitted Disease by Geographic Location

**Age and Number of sexual partners in the past 12 months**
- age\(^b\)
- sexual partners\(^b\)

\(^a\) percentages and chi-square analysis
\(^b\) mean($SD$) provided

Binary logistic regression was employed with the dependent variable being “Have you received the HPV vaccine” which is dichotomous (yes/no). Independent variables in the binary logistic analysis will include: race, geographic region of the institution, receiving STD information, having a gynecological exam in the past 12 months, receiving the Hepatitis B vaccine series, receiving the flu vaccine, primary source of insurance, age, and number of sexual partners in the past 12 months. See table 3 for dependent and independent variables included in the binary regression.
Table 3.2
*Variables included in the binary logistic regression analysis*

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>HPV Vaccination</th>
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<tbody>
<tr>
<td><strong>Independent Variables</strong></td>
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<tr>
<td>-Race</td>
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<tr>
<td>White/non-Hispanic</td>
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<td>Black/non-Hispanic</td>
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<td>Hispanic/Latino</td>
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<td>Asian/Pacific Islander</td>
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<td>Native American/Native Alaskan/Native Hawaiian</td>
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<td>Biracial/Multiracial</td>
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<tr>
<td>Other</td>
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<tr>
<td>-Geographic Region</td>
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<td>Northeast</td>
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<td>Midwest</td>
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<td>South</td>
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<tr>
<td>West</td>
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<tr>
<td>-Received Information Regarding Sexually Transmitted Diseases</td>
<td></td>
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<tr>
<td>-Received Gynecological exam in past 12 months</td>
<td></td>
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<tr>
<td>-Past Hepatitis B Vaccination</td>
<td></td>
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<tr>
<td>-Past influenza Vaccination</td>
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<tr>
<td>-Primary Source of Insurance</td>
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<td>College/university plan</td>
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<td>Parents’ plan</td>
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<tr>
<td>Another plan</td>
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<tr>
<td>No health insurance</td>
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<tr>
<td>-Age in years</td>
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<tr>
<td>-Number of Sexual Partners in the Past 12 Months</td>
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</table>

Categorical independent variables included: race (1=White/non-Hispanic, 2=Black/non-Hispanic, 3=Hispanic/Latino, 4=Asian/Pacific Islander, 5=American Indian/Alaskan Native/Native Hawaiian, 6=Biracial/Multiracial, 7=Other), geographic location of the educational institution (coded 1=Northeast, 2=Midwest, 3=South, 4=West) as defined by the US Census Bureau (Appendix E), receiving STD information from the respondents college or university (yes/no), having a gynecological exam in the past 12 months (yes/no), Hepatitis B vaccination (yes/no), influenza vaccination (yes/no), and source of insurance
Continuous independent variables included age and number of sexual partners within the past 12 months. IBM SPSS Statistic 20 computer software will be used to complete the data analysis.

**Brief summary selection of independent variables**

**Race, age, and geographic location**

The majority of vaccination and disease burden rates are published by gender, race, and/or age by federal agencies such as the Centers for Disease Control. Being a member of an ethnic minority has been linked to decreased cervical cancer screening (McAlearney, et al., 2010, Rodriques, et al., 2005, Swan, et al., 2003, Solomon, et al., 2007). Hispanic women have a low rate of cervical cancer screening (Rodriquez, et al., 2005). Ethnic diversity is considered a barrier to HPV vaccination (Herzog, et al., 2008). However, Caskey, et al., (2009) demonstrated that race was not a predictor of vaccination. Black women had a lower awareness and knowledge of the HPV vaccine compared to white women (Crates, et al., 2009). Caskey et al. (2009) reported that white college women were more likely to be vaccinated compared to black or Asian women. Brewer et al. (2007) did not demonstrate that race was a predictor of HPV vaccine uptake. In addition, the CDC reported that cervical cancer rates are higher among blacks and Hispanics compared to whites (CDC, 2012). There are contradictory findings concerning race and HPV vaccine uptake in college women.

Geographic location is referenced in several studies of individual institutions (Bendik, et al., 2011, Caron, et al., 2009, D’Urso, et al., 2007). Providing HPV vaccination rates by race and geographic location may be informative for future researchers.
Have you received information on Sexually transmitted disease/infection (STD/I) prevention from your college or university?

A barrier to HPV vaccination is lack of knowledge about the virus and its association with the development of genital warts and various cancers (Brewer, et al., 2007, Giambi, et al., 2011, Rosenthal, et al., 2011). College students are at high risk for HPV exposure but do not believe that they are at risk (Bendik, et al., 2011, Yacobi, et al., 1999, Val-Smith, et al., 1992). Burak, et al. (2011) demonstrated that 80% of college women believed that they were not susceptible to sexually transmitted diseases when, in fact, they were at risk. Cognitive understanding of HPV is an important factor in understanding the dangers of the virus (Kahn, et al., 2007). Brief educational intervention was also shown to increase knowledge of HPV (Lambert, 2001). Women who knew the cause of genital warts were more likely to receive the vaccine (Licht, et al., 2009).

Gynecological exam in the past 12 Months

Physician recommendation is strongly related to HPV vaccination (Bendik, et al., 2011). Vaccine acceptability was higher when individuals believed that their physician would recommend it (Brewer, et al., 2007). One study of professional women found that 71.6% of respondents reported that their physicians did not discuss HPV with them (Cermak, et al., 2010). Keane, et al. (2005) cited that doctors and nurses are sources of credible information regarding vaccination. Marchand et al, (2012) emphasized the need for provider education to increase HPV vaccine uptake in college age women. Gynecologists are a source of care for sexual health of college women and therefore, a potential source of information regarding HPV.
Received Hepatitis B vaccination

Hepatitis B is a mandatory vaccination for admission to many publically funded universities. The vaccine is given in a series of three injections, as is the HPV vaccine. The Centers for Disease Control and Prevention (2008) reports that uptake of the Hepatitis B vaccine is 92.3%, which can serve as a possible contrast.

Received Influenza vaccination

Influenza and HPV vaccination are similar in that they are both voluntary vaccinations that protect against future infection. Influenza vaccination rates in college students have also been explained by the Health Belief Model. Increased susceptibility and morbidity of the flu increased the intention to receive the vaccine (Teiter-Regev, et al., 2011). Arguably, the flu vaccine receives more media coverage and physician recommendations which can also serve as a contrast to the HPV vaccine.

Primary source of health insurance

Socioeconomic status and lack of health insurance is linked to decreased cervical cancer screening (Kessel, et al., 2012, Rodriques, et al., 2005). Higher HPV vaccine up-take was associated with having health insurance (Kassels, et al., 2012). Women in a poor rural area of Ohio were more likely to perceive lack of insurance as a barrier to cervical cancer screening (McAlearney, et al., 2010). Hispanic women were found to have higher cancer screening rates when they had health insurance (Zambrana, et al., 1999). In a low income setting, Kahn, et al. (2008) reported that insurance coverage was significant in a logistic regression model.

Number of sexual partners in the past 12 months

Jones, et al. (2008) linked an increase in the number of sexual partners with increased intent to receive the HPV vaccine. A potential barrier to adoption of the HPV vaccine is lack of
first sexual contact (Caskey, et al., 2009). The belief that virginity negates the need for vaccination may stop women from seeking the vaccine. Caron, et al (2009) in a limited study found that 56.5% of sexually active women were aware of HPV but did not think they were at risk for infection.

**Conclusion**

The dependent variable in this analysis was receiving the HPV vaccine, the purpose of the chosen methodology was to determine which independent variables were statistically significant. The independent variables in the analysis were race, geographic location, receiving STD information, gynecological exams in the past 12 months, receiving the Hepatitis B vaccine and influenza vaccine, age, and number of sexual partners.
CHAPTER 4

RESULTS

Introduction

The focal point of this chapter is to present a synopsis of the findings. Female students included in the analysis were between the ages of 18-26 who participated in the ACHA-NCHA survey during the following semesters: fall 2008, spring and fall 2009 and fall 2010. The 253 institutions that administered the survey were not identified. The Standards for the Classification of Federal Data on Race and Ethnicity (1997) calls for racial categories that include White/non-Hispanic, Black/non-Hispanic, Hispanic/Latino, Asian/South Pacific Islanders, and Native American/Alaskan Native/Hawaiian Native. The federal government is supportive of the Biracial/Multiracial category. This analysis endeavored to adhere to these racial classification guidelines.

The ACHA-NCHA survey utilized the federally recommended racial categories. Therefore, these categories were maintained in this study. The racial category “other” was maintained, this category is un-defined making it problematic to describe to any existing data. Exclusion of respondents that indicated only Biracial/Multiracial or “other” was not done. There is a growing recognition in the field of public health that because of the growing diversity of the United States and the use of self-identification in surveys more respondents in the future may classify themselves in this manner and exclusion of these groups may place them at a disadvantage, or fail to show trends in these racial categories (Mays, et al., 2003). The use of un-definable racial categories presents researchers with some major challenges, clear definition of racial categories is important to studies in which epidemiology (the distribution and determinants of health related states and trends) and race is examined. When determining health trends,
setting policy and evaluating health related programs it is imperative to ensure that demographic characteristics are unambiguous as possible. When asked for race, respondents of the ACHA-NCHA were instructed to mark “all that apply”, which failed to be mutually exclusive. As a result, assigning respondents a racial category who identified themselves in more than one racial category was complicated due to the lack of a sound allocation process (Liebler, C., et al., 2008, Mays, V., 2003). It was decided, therefore, that it was important to limit the subjective bias of the researcher. Subsequently, those respondents were excluded along with respondents that failed to identify any race (n=20,992). Since the CDC reports vaccination and health behavior rates by racial category, it was decided that that epidemiological format be maintained in the reporting of statistics. Survey respondents were also excluded if they did not answer the HPV vaccination status question or they answered that they did not know if they received the vaccine (n=2,120).

After the qualifying standards were set (i.e. female students between the ages of 18-26 who identified a single racial category and who reported that they knew their HPV vaccine status) the total sample in this analysis was N=68,193. The average respondent age was 20.5 years and 85.8% of students reported that they had attended college/university four years or less. Furthermore, 95.5% of students were enrolled full time.

Demographics by race

The racial demographics of the respondents were White/non-Hispanic (76%), Black/non-Hispanic (7%), Hispanic/Latino (6%), Asian/Pacific Islander (9%), American Indian/Alaskan Native/Native Hawaiian (1%), Biracial/Multiracial (0.1%), and other (1%). The Biracial/Multiracial category is possibly underrepresented with only 40 respondents. Table 3.1 displays respondent demographics by race and mean age for each racial category.
### Table 4.1

**Demographics (n=68193)**

<table>
<thead>
<tr>
<th>Race</th>
<th>n (%)&lt;sup&gt;a&lt;/sup&gt;</th>
<th>M(SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>White/non-Hispanic</td>
<td>51,826 (76)</td>
<td>20(1.3)</td>
</tr>
<tr>
<td>Black/non-Hispanic</td>
<td>4,400 (7)</td>
<td>20(2.1)</td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>4,134 (6)</td>
<td>20(2.2)</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>6,102 (9)</td>
<td>21(2.2)</td>
</tr>
<tr>
<td>American Indian/Alaskan Native/Native Hawaiian</td>
<td>795 (1)</td>
<td>21(1.8)</td>
</tr>
<tr>
<td>Biracial/Multiracial</td>
<td>40 (.1)</td>
<td>19(1.7)</td>
</tr>
<tr>
<td>Other</td>
<td>896 (1)</td>
<td>21(2.0)</td>
</tr>
</tbody>
</table>

<sup>a</sup> percentage do not equal 100% due to rounding

### Demographics by geographic location

Geographically, the Northeast region had the highest percentage of respondents (30%) followed by, the Southern (29%), Midwest (20%), and Western (20%) regions. The average age of respondents was similar, ranging from 20-21 years of age. Table 3.2 provides the number of respondents within each region along with their mean age.

### Table 4.2

**Number of women by geographic region (n=68042)<sup>a</sup>**

<table>
<thead>
<tr>
<th>Region</th>
<th>n (%) within total population</th>
<th>mean age (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northeast</td>
<td>20,579 (30)</td>
<td>20(2)</td>
</tr>
<tr>
<td>Midwest</td>
<td>13,875 (20)</td>
<td>21(2)</td>
</tr>
<tr>
<td>South</td>
<td>19,972 (29)</td>
<td>20(2)</td>
</tr>
<tr>
<td>West</td>
<td>13,616 (20)</td>
<td>21(2)</td>
</tr>
</tbody>
</table>

<sup>a</sup>n=151(0.002%) cases not classified by region note: % does not equal 100% due to rounding
**HPV vaccination rates by race**

In this analysis, 33,554 women (49%) received the HPV vaccine. The rate of HPV vaccination varies by racial category. White/non-Hispanic women had an HPV vaccination rate of 51%. The vaccination rate among American Indian/Alaskan Native/Native Hawaiian women was 47% while Hispanic/Latino women had a vaccination rate of 46%. The rate of vaccination among Black/non-Hispanic women and Asian/Pacific Islander women were 44% and 40%, respectively. Biracial/Multiracial women had a vaccination rate of 60%, which should be viewed with caution given the low sample size (n=40). Women who identified themselves as “other” had the lowest vaccination rate (38%). A chi-square analysis was performed to determine whether statistically significant differences in HPV vaccination rates existed between racial categories. It should be noted that due to the large sample size it was expected that chi-square analysis would yield statistically significant results. In fact, the distribution of HPV vaccination rates between racial groups proved to be statistically significant ($X^2(6, N=68,193) =398.114, p=000$). Table 3.3 lists HPV vaccination rates by racial category.

<table>
<thead>
<tr>
<th>Women who received the HPV vaccine by race*(n=68193)</th>
<th>n (% within race)</th>
</tr>
</thead>
<tbody>
<tr>
<td>White/non-Hispanic</td>
<td>26,598(51)</td>
</tr>
<tr>
<td>Black/non-Hispanic</td>
<td>1,933(44)</td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>1,910(46)</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>2,458(40)</td>
</tr>
<tr>
<td>American Indian/Alaskan Native/Native Hawaiian</td>
<td>377(47)</td>
</tr>
<tr>
<td>Biracial/Multiracial</td>
<td>24(60)</td>
</tr>
<tr>
<td>Other</td>
<td>341(38)</td>
</tr>
</tbody>
</table>

*p=.000, differences in vaccination rates between racial categories proved significant
HPV vaccination by geographic region

HPV vaccination rates were the highest in the Northeast region (55%). The rate of vaccination in the Southern, Midwest and Western regions were, respectively, 49%, 45% and 45%. A chi-square analysis was performed to investigate whether the HPV vaccination rates were statistical significance differences between the geographic regions. The distribution of HPV vaccination rates between geographic regions was statistically significant ($X^2(3, N=68042) = 435.752, p=0.000$). Table 4.4 demonstrates HPV vaccination rates within the four geographic regions.

<table>
<thead>
<tr>
<th>Geographic Region</th>
<th>n(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northeast</td>
<td>11,276(55)</td>
</tr>
<tr>
<td>Midwest</td>
<td>6,295(45)</td>
</tr>
<tr>
<td>South</td>
<td>9,858(49)</td>
</tr>
<tr>
<td>West</td>
<td>6,125(45)</td>
</tr>
</tbody>
</table>

*missing cases excluded*

*p=0.000, differences in vaccination rates between geographic regions proved significant*

STD information gathering

The independent variable “have you received information on sexually transmitted disease/infection prevention from your college or university” is a dichotomous (yes/no) variable. 55% (n=36996) of women received information regarding STD’s. Black/non-Hispanic women had the highest rate of receiving STD information from their college/university (65%). Hispanic/Latino women and those who identified themselves as “other” reported receiving STD
information at a rate of 56%. Fifty four percent of White/non-Hispanic and Asian/Pacific Islanders women reported receiving STD information. American Indian/Alaskan Native/Native Hawaiian women had a HPV vaccination rate of 50%. Finally, it was demonstrated that 66% of Biracial/Multiracial women received STD information which should be regarded with caution given the small sample size of that category.

In the Northeast region, 58% of respondents reported receiving STD information, while 57% of Southern region respondents reported receiving STD information. 53% of women in the Midwest region reported receiving STD information and only 47% of Western region respondents reported having received STD information. STD information gathering within racial category and geographic region is demonstrated in Table 3.5.

<table>
<thead>
<tr>
<th>Race</th>
<th>n( % within race)</th>
</tr>
</thead>
<tbody>
<tr>
<td>White/non-Hispanic</td>
<td>27,853(54)</td>
</tr>
<tr>
<td>Black/non-Hispanic</td>
<td>2,682(65)</td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>2,294(56)</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>3,254(54)</td>
</tr>
<tr>
<td>American Indian/Alaskan Native Hawaiian</td>
<td>395(50)</td>
</tr>
<tr>
<td>Biracial/Multiracial</td>
<td>24(66)</td>
</tr>
<tr>
<td>other</td>
<td>494(56)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Geographic region</th>
<th>n( %within region )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northeast</td>
<td>11,934(58)</td>
</tr>
<tr>
<td>Midwest</td>
<td>7,352(53)</td>
</tr>
<tr>
<td>South</td>
<td>11,247(57)</td>
</tr>
<tr>
<td>West</td>
<td>6,363(47)</td>
</tr>
</tbody>
</table>
Overall, 52% (n=19,239) of students who received the HPV vaccine received STD information whereas 46% (n=14,027) of women who received the HPV vaccine did not receive STD information. A chi-square analysis was used to determine if there was statistical difference between HPV vaccination rates and the rate of receiving STD information. A statistical significance between HPV vaccination and receiving STD information was demonstrated ($X^2(1, N=67,420) = 232.332, p=.000$) and is presented in Figure 3.1.

![Figure 4.1](image)

**Figure 4.1**
Percentage of respondents that received HPV vaccination when examining receiving and not receiving STD information

Health Behaviors

Health Behaviors in the study include receiving a gynecological exam within 12 months, receiving the Hepatitis B vaccine, receiving the influenza vaccine, primary source of insurance, and number of sexual partners. 54% (n=36,961) of women in the analysis reported receiving a gynecological exam in the past months. 5.5% (n=372) of the women in this study group could not recall if they had a gynecological exam in the past 12 months. White/non-Hispanic women
had the highest rate of receiving a gynecological exam (58%) and those women who identified themselves as “other” had a gynecological exam rates of 55%. American Indian/Alaskan Native/Native Hawaiian women 54% and 53% of Black/non-Hispanic women had a gynecological exam in the past 12 months. 44% Hispanic/Latino women received a gynecological exam in the past 12 months. Women who identified themselves as Biracial/Multiracial had a rate of gynecological exams in the past 12 months of 43%. Finally, the racial category with the lowest gynecological exam rate in the past 12 months was Asian/Pacific Islander women (28%).

The geographic region with the highest rate of gynecological exams is the Midwest region (60%). The Northeast and Southern regions had gynecological exam rates of 55% and 53%. The region with the lowest gynecological exam rate is the Western region (49%).

It was demonstrated that 55% \((n=20,227)\) of women that had a gynecological exam in the past 12 months also had the HPV vaccine. On the other hand, 43% \((n=13,043)\) of women who received the HPV vaccine did not have a routine gynecological exam. Gynecological exam in the past 12 months is a dichotomous (yes/no) variable. A chi-square analysis was performed to determine if there were differences in HPV vaccination rates between women who received and did not receive the gynecological exam in the past 12 months. The difference in HPV vaccine rates were statistically significant between groups \((X^2(1, N=66,355) =969.517, p=.000)\).

Gynecological exam status and HPV vaccination rates between groups are shown in figure 3.2. Table 3.6 lists health behaviors by racial category and geographic region.
The Hepatitis B vaccine is often mandatory when enrolling in college/university. 92% (n=62,446) of women in the analysis received the Hepatitis B vaccine. The racial category with the highest Hepatitis B vaccination was White/non-Hispanic women (93%). Asian/Pacific Islanders had the lowest Hepatitis B vaccination rate (85%). This independent variable is dichotomous (yes/no). A chi-square analysis was performed to determine if there was a difference between the rate of HPV vaccination between women who did and did not receive the Hepatitis B vaccine, this proved to be statistical significance ([X2(1, N=68,023) =2572.261, p=.000]). Figure 3.3 demonstrates that 52% of women who received the HPV vaccine received the Hepatitis B vaccine, while only 17% of women who did not received the Hepatitis B vaccine received the HPV vaccine.
When exploring Hepatitis B vaccination by region the highest rate was within the Northeast region (93%). The Midwest and Southern region had a vaccination rate of 92%. The Western region had the lowest Hepatitis B vaccination rate (89%). These high vaccination rates are reflective of the common practice of mandating the Hepatitis B vaccine for matriculation into higher learning institutions.

Influenza vaccination rates were considerably smaller than Hepatitis B rates. 37% ($n=25,528$) of the sample reported receiving the influenza vaccine. Asian/Pacific Islanders have the highest influenza vaccination rate (44%). The remaining racial categories have influenza vaccination rates between 36-38%. The geographic region with the highest influenza vaccination rates was the Northeastern region (40%). The influenza vaccination rate in the Southern region was 38% and the Midwestern region 36%. The region with the lowest influenza vaccination rate was the Western region (34%).

Figure 4.3
Percentage of respondents that received the HPV vaccine when examining Hepatitis B vaccination status
Women who had both the influenza vaccine and the HPV vaccine was 24% \((n=16,458)\). This independent variable was dichotomous (yes/no). 64% of the women that did have the influenza vaccine also had the HPV vaccine. A chi-square analysis was performed to determine if there was a difference between the rate of HPV vaccination between those who did and those who did not receive the influenza vaccine. The analysis proved that there was statistical significance \((\chi^2, n=66,355) = 3612.285, p<.000\) between the two groups. Figure 3.4 demonstrates the HPV vaccination rates depending on influenza vaccination status.

![Figure 4.4](image)

Percentage of respondents that received the HPV vaccine when examining Influenza vaccination status

The independent variable primary source of insurance is divided into 4 categories: college/university plan, parents’ plan, another plan, and no insurance. White/non-Hispanic women had the highest rate of having insurance coverage (96%), and women who identified themselves as “other” 93%. Ninety-four percent of Asian/Pacific Islanders reported having health insurance and the category “other” reported a 93% insurance coverage rate. Black/non-
Hispanic reported having insurance coverage at a rate of 91%, and American Indians/Alaskan Native/Native Hawaiians 90%. Finally, Hispanic/Latino women had the lowest rate of having insurance coverage (87%).

The majority of women reported that they were covered by their parents’ insurance (75%). Those reporting that they were covered by plans provided by institutions of higher learning were 13%. Seven percent of women reported that they were covered by another source of insurance. Lastly 5% of students reported that they had no source of health insurance.

Health insurance coverage in all geographic regions was high. The Northeast region had the highest rate of insurance coverage (98%). In the Midwest region 95% of respondents had insurance coverage and in the Southern region 94%. The region with the lowest rate of insurance coverage was the Western region (91%).

It was determined that 1% (n=893) of students had the HPV vaccine did not have insurance coverage. Conversely 54% of women who were covered by their parents’ insurance received the HPV vaccine. A chi-square analysis was performed to investigate whether there were statistically significant differences in HPV vaccination rates between insurance coverage categories. The analysis determined that there was statistical significance between HPV vaccination and primary source of insurance ($X^2(3, N=68,003) = 1954.246, p=.000$). Figure 4.5 shows the HPV vaccination rate per insurance coverage category.
Number of sexual partners is a continuous variable, the average number of sexual partners was 1.3 (SD=1.8). The mean number of sexual partners by race and geographic region ranges between .8 and 1.5. Women who report zero sexual partners in the past twelve months was 30% (n=20,458). Respondents with one to two sexual partners was 53% (n=36,093), three to four sexual partners 9% (n=6,136), and 7% (n=4,760) reported having more than 5 sexual partners. The number of respondents that did not answer the question regarding number of sexual partners was 746. Table 4.6 demonstrates the health behaviors within racial categories and geographic region.
Table 4.6  
*Health behaviors*

<table>
<thead>
<tr>
<th>within racial categories</th>
<th>Gynecological exam within 12 months</th>
<th>Received Hepatitis B Vaccine</th>
<th>Received Influenza Vaccine</th>
<th>Insurance coverage</th>
<th>Average number of Sexual Partners</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n(%)</td>
<td>n(%)</td>
<td>n(%)</td>
<td>M(SD)</td>
</tr>
<tr>
<td>White/non-Hispanic</td>
<td>30,239(58)</td>
<td>48,087(93)</td>
<td>19,035(37)</td>
<td>49,753(96)</td>
<td>1.3(1.8)</td>
</tr>
<tr>
<td>Black/non-Hispanic</td>
<td>2,339(53)</td>
<td>3,853(88)</td>
<td>1,623(37)</td>
<td>4,004(91)</td>
<td>1.5(2)</td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>1,806(44)</td>
<td>3,741(90)</td>
<td>1,580(38)</td>
<td>3,597(87)</td>
<td>1.2(1.6)</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>1,726(28)</td>
<td>5,216(85)</td>
<td>2,659(44)</td>
<td>5,736(94)</td>
<td>0.8(1.4)</td>
</tr>
<tr>
<td>American Indian/Alaskan Native/Native Hawaiian</td>
<td>431(54)</td>
<td>731(92)</td>
<td>289(38)</td>
<td>716(90)</td>
<td>1.3(1.9)</td>
</tr>
<tr>
<td>Biracial/Multiracial</td>
<td>18(43)</td>
<td>36(90)</td>
<td>15(38)</td>
<td>38(95)</td>
<td>1.6(2)</td>
</tr>
<tr>
<td>other</td>
<td>402(55)</td>
<td>782(87)</td>
<td>327(36)</td>
<td>833(93)</td>
<td>1.5(1.9)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>within geographic regions</th>
<th>n(%)</th>
<th>n(%)</th>
<th>n(%)</th>
<th>n(%)</th>
<th>M(SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northeast</td>
<td>11,333(55)</td>
<td>19,102(93)</td>
<td>8,193(40)</td>
<td>2,0113(98)</td>
<td>1.3(1.9)</td>
</tr>
<tr>
<td>Midwest</td>
<td>8,289(60)</td>
<td>12,703(92)</td>
<td>4,974(36)</td>
<td>13,216(95)</td>
<td>1.3(1.8)</td>
</tr>
<tr>
<td>South</td>
<td>10,660(53)</td>
<td>18,344(92)</td>
<td>7,589(38)</td>
<td>18,790(94)</td>
<td>1.3(1.8)</td>
</tr>
<tr>
<td>West</td>
<td>6,604(49)</td>
<td>12,170(89)</td>
<td>4,688(34)</td>
<td>12,568(92)</td>
<td>1.2(1.9)</td>
</tr>
</tbody>
</table>
Correlations

Correlation between variables was analyzed. HPV vaccination and race shows a strong negative correlation ($r(66,699) = -.68, p \leq .01$). The remaining variables show negligible to weak correlations (+/- .01 to +/- .29). All variables tested significant ($p \leq .01$) excluding the correlation between race and receiving STD information ($p = .156$). Table 3.7 provides the correlation matrix.

Table 4.7
*Correlation* between measures

<table>
<thead>
<tr>
<th></th>
<th>Race</th>
<th>Region</th>
<th>Received STD Information</th>
<th>Gynecological Exam in past 12 Months</th>
<th>Hepatitis B Vaccination</th>
<th>Influenza Vaccination</th>
<th>Source of Health Insurance</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPV vaccination</td>
<td>-0.68*</td>
<td>-0.06*</td>
<td>0.058*</td>
<td>0.118*</td>
<td>0.192*</td>
<td>0.233*</td>
<td>-0.042*</td>
</tr>
<tr>
<td>Race</td>
<td>0.071*</td>
<td>-0.005</td>
<td>-0.14*</td>
<td>-0.069*</td>
<td>0.028*</td>
<td>0.028*</td>
<td>-0.024*</td>
</tr>
<tr>
<td>Region</td>
<td>-0.062*</td>
<td>-0.048*</td>
<td>0.018*</td>
<td>0.038*</td>
<td>0.026*</td>
<td>-0.045*</td>
<td>0.106*</td>
</tr>
<tr>
<td>Received STD Information</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gynecological exam in past 12 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatitis B vaccination</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Influenza vaccination</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p \leq .01

*aTaking into account missing cases N=66701*
Binary logistic regression model

\[
\text{Log (odds of having a HPV vaccine)} = 1.88 \times \text{Race(Black)} - 1.02 \times \text{Race(Hispanic/Latino)} - 0.23 \times \text{Race(Asian/Pacific Islander)} - 0.16 \times \text{Race(American Indian/Alaskan Native/Native Hawaiian)} + 0.256 \times \text{Race(Biracial/Multiracial)} - 0.443 \times \text{Region(Midwest)} - 0.266 \times \text{Region(South)} - 0.202 \times \text{Region(West)} + 0.049 \times \text{Received STD information} + 0.661 \times \text{Received gynecological exam in the past 12 months} + 1.411 \times \text{Received the Hepatitis B} + 0.937 \times \text{Received the Influenza vaccine} + 0.315 \times \text{Source of Insurance(College/University plan)} + 0.613 \times \text{Source of Insurance(Another plan)} - 0.246 \times \text{age in years} + 0.053 \times \text{number of sexual partners where the odds } = p/(1-p) \text{ and } p \text{ is the probability}
\]

Binary logistic regression results

The binary regression model defines the relationship between the independent variables (race, geographic region, receiving information regarding STD’s, having a gynecological exam in the past 12 months, receiving the Hepatitis B vaccine, receiving the influenza vaccine, primary source of health insurance, age, and number of sexual partners) and the dependent variable, HPV vaccination. The racial categories Black/non-Hispanic, Hispanic, Asian/Pacific Islander, American Indian/Alaskan Native/Hawaiian Native, and “Other” all proved significant in predicting HPV vaccination rates ($R^2=.156, p<.01$). Biracial/Multiracial did not test significant ($p=.467$), which is most likely due to the small sample size ($n=37$). Furthermore, geographic location significantly predicted HPV vaccination ($R^2=.156, p<.001$). Receiving STD information, having a gynecological exam within the last 12 months, receiving the Hepatitis B vaccination and receiving the influenza vaccination were also predictive of HPV vaccination ($R^2=.156, p<.001$). Insurance coverage was predictive of HPV vaccination ($R^2=.156, p<.001$) as was age ($R^2=.156, p<.001$). For every one year increment in age there is a .246 decrease in the log-odds of having received the HPV vaccine. In other words, as age increases the likelihood of receiving the HPV vaccine decreases. In addition, the number of sexual partners in the past 12 months was significant ($R^2=.156, p<.001$). Every .053 increase in the number of sexual partners
increases the likelihood of receiving the HPV vaccine. The Hosmer-Lemshow statistic did not demonstrate goodness of fit $X^2(8, N=67,110) = 18.66$, which is not surprising given the large sample size. Hosmer-Lemshow statistics in sample sizes over 13,000 tend to not demonstrate goodness of fit. There is debate whether the use of the pseudo-$R^2$ is useful in the analysis of binary logistic regression, since the measure is rightfully designed to be used in linear regression analysis. In this study it was decided that using the pseudo-$R^2$ would aid in demonstrating the explanatory value of the model. Table 4.8 provides the variables in binary regression results.
## Table 4.8
Variables in the equation

<table>
<thead>
<tr>
<th>Variable</th>
<th>B(SE)</th>
<th>Wald</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White/non-Hispanic (ref)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black/non-Hispanic*</td>
<td>-0.295(0.037)</td>
<td>62.963</td>
<td>0.000</td>
</tr>
<tr>
<td>Hispanic/Latino**</td>
<td>-0.102(0.037)</td>
<td>7.545</td>
<td>0.006</td>
</tr>
<tr>
<td>Asian/Pacific Islander*</td>
<td>-0.23(0.032)</td>
<td>51.079</td>
<td>0.000</td>
</tr>
<tr>
<td>American Indian/Alaskan Native/Native Hawaiian***</td>
<td>-0.16(0.079)</td>
<td>4.117</td>
<td>0.042</td>
</tr>
<tr>
<td>Biracial/Multiracial</td>
<td>0.256(0.351)</td>
<td>0.529</td>
<td>0.467</td>
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<tr>
<td>Other*</td>
<td>-0.443(0.078)</td>
<td>32.133</td>
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</tr>
<tr>
<td><strong>Geographic Location</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast (ref)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Midwest*</td>
<td>-0.403(0.025)</td>
<td>269.653</td>
<td>0.000</td>
</tr>
<tr>
<td>South*</td>
<td>-0.266(0.022)</td>
<td>142.342</td>
<td>0.000</td>
</tr>
<tr>
<td>West*</td>
<td>-0.202(0.025)</td>
<td>65.675</td>
<td>0.000</td>
</tr>
<tr>
<td><strong>Receiving STD Information</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not receive(ref)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did receive*</td>
<td>0.049(0.017)</td>
<td>8.013</td>
<td>0.005</td>
</tr>
<tr>
<td><strong>Gynecologic examination</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not receive(ref)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did receive*</td>
<td>0.661(0.018)</td>
<td>1303.057</td>
<td>0.000</td>
</tr>
<tr>
<td><strong>Hepatitis B vaccination</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not receive(ref)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did receive*</td>
<td>1.411(0.039)</td>
<td>1287.652</td>
<td>0.000</td>
</tr>
<tr>
<td><strong>Influenza vaccination</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not receive(ref)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did receive*</td>
<td>0.937(0.018)</td>
<td>2787.88</td>
<td>0.000</td>
</tr>
<tr>
<td><strong>Source of Insurance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No insurance (ref)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>College/University plan*</td>
<td>0.315(0.05)</td>
<td>41.064</td>
<td>0.000</td>
</tr>
<tr>
<td>Parents’ plan*</td>
<td>0.613(0.045)</td>
<td>186.111</td>
<td>0.000</td>
</tr>
<tr>
<td>Another plan*</td>
<td>0.361(0.055)</td>
<td>43.675</td>
<td>0.000</td>
</tr>
<tr>
<td><strong>Age in years</strong></td>
<td>-0.246(0.005)</td>
<td>2251.589</td>
<td>0.000</td>
</tr>
<tr>
<td><strong>Number of sexual partners</strong></td>
<td>0.053(0.005)</td>
<td>97.835</td>
<td>0.000</td>
</tr>
<tr>
<td>Constant</td>
<td>1.888(0.121)</td>
<td>244.563</td>
<td></td>
</tr>
</tbody>
</table>

Note: *Pseudo R² Cox & Snell = .156; Nagelkerke= .208, -2
Log likelihood 79874.772, df=18, S.E. =.008, (ref)=reference category
* continuous variable
*p≤.001
**p≤.01
***p≤.05
The odds-ratios, \( \text{Exp B} \), are given with respective 95% confidence intervals. Reference categories were established to allow for easier interpretation of odds ratios. Examining vaccination rates determined that White/non-Hispanic women had the highest HPV vaccination rate (51%). Therefore, White/non-Hispanic women became the reference group in the regression model. The reference group for region is Northeast since it had the highest HPV vaccination rate (55%). Receiving STD information is a dichotomous variable and the reference category was not receiving STD information. Having a gynecological exam in the past 12 months is dichotomous and the reference category was not having a gynecological exam in the past 12 months. Hepatitis B and influenza vaccination are dichotomous; the reference category for both is not receiving the vaccine. Primary source of health insurance has four categories, college/university plan, parents’ plan, another plan, and no insurance. No insurance is the reference category in the variable which makes interpreting the odds-ratios less difficult.

The odds-ratio demonstrated that White/non-Hispanic women (referent category, OR=1) have a higher likelihood of receiving the HPV vaccination compared to the following categories: (Black/ non-Hispanic (OR=.744, 95% CI=.692-.801), Hispanic/Latino (OR=.903, 95% CI=.84-.971), Asian/Pacific Islander (OR=.795, 95% CI=.746-.847), American Indian/Alaskan Native/Native Hawaiian (OR=.852, 95% CI=.73-.995), other (OR=.642, 95% CI=.643-.551). Using the Northeast as a reference category (OR=1), the Midwestern (OR=.668, 95% CI=.637-.701), Southern (OR=.766, 95% CI=.733-.800) and Western (OR=.817, 95% CI=.778-.858) regions demonstrate a lower likelihood of receiving the HPV vaccine. Receiving STD information from the college/university increases the likelihood of receiving the HPV vaccine (OR=1.05, 95% CI=1.015-1.086) as does having a gynecological exam in the past 12 months.
(OR=1.936, 95% CI=1.868-2.007). Receiving the Hepatitis B (OR=4.1, 95% CI=3.796-4.428) and influenza (OR=2.553, 95% CI=2.465-2.643) vaccines also increases the likelihood of receiving the HPV vaccine. A primary source of health insurance, college/university plan (OR=1.371, 95% CI=1.242-1.513), parents’ insurance plan (OR=1.845, 95% CI=1.689-2.016), or another plan (OR=1.434, 95% CI=1.289-1.596) also increases the likelihood of receiving the HPV vaccine compared to lacking health insurance (reference category, OR=1). Table 4.9 provides the odds-ratios and 95% confidence intervals as determined by the logistic regression. Appendix F provides the variable coding, Omnibus Test of Model Coefficients, Model Summary, Hosmer and Lemeshow Test and Contingency Table, and Classification Table.
Table 4.9
Odds-ratios with 95% confidence intervals

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White/non-Hispanic (ref)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Black/non-Hispanic*</td>
<td>0.744</td>
<td>0.692 - 0.801</td>
</tr>
<tr>
<td>Hispanic/Latino**</td>
<td>0.903</td>
<td>0.84 - 0.971</td>
</tr>
<tr>
<td>Asian/Pacific Islander*</td>
<td>0.795</td>
<td>0.746 - 0.847</td>
</tr>
<tr>
<td>American Indian/Alaskan Native/Native Hawaiian***</td>
<td>0.852</td>
<td>0.73 - 0.995</td>
</tr>
<tr>
<td>Biracial/Multiracial</td>
<td>1.291</td>
<td>0.648 - 2.572</td>
</tr>
<tr>
<td>Other*</td>
<td>0.642</td>
<td>0.551 - 0.748</td>
</tr>
<tr>
<td><strong>Geographic Location</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast (ref)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Midwest*</td>
<td>0.668</td>
<td>0.637 - 0.701</td>
</tr>
<tr>
<td>South*</td>
<td>0.766</td>
<td>0.733 - 0.8</td>
</tr>
<tr>
<td>West*</td>
<td>0.817</td>
<td>0.778 - 0.858</td>
</tr>
<tr>
<td><strong>Receiving STD Information</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not receive(ref)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Did receive*</td>
<td>1.05</td>
<td>1.01 - 1.086</td>
</tr>
<tr>
<td><strong>Gynecologic examination</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not receive(ref)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Did receive*</td>
<td>1.936</td>
<td>1.868 - 2.007</td>
</tr>
<tr>
<td><strong>Hepatitis B vaccination</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not receive(ref)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Did receive*</td>
<td>4.1</td>
<td>3.796 - 4.428</td>
</tr>
<tr>
<td><strong>Influenza vaccination</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not receive(ref)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Did receive*</td>
<td>2.553</td>
<td>2.465 - 2.643</td>
</tr>
<tr>
<td><strong>Source of Insurance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No insurance (ref)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>College/University plan*</td>
<td>1.371</td>
<td>1.242 - 1.513</td>
</tr>
<tr>
<td>Parents’ plan*</td>
<td>1.845</td>
<td>1.689 - 2.016</td>
</tr>
<tr>
<td>Another plan*</td>
<td>1.434</td>
<td>1.289 - 1.596</td>
</tr>
</tbody>
</table>

*p < .001
**p < .01
***p < .05
Note: reference category (ref)
Conclusion

The large sample size \(N=68,193\) provided by the ACHA-NCHA survey allowed the researcher to examine selected factors that may influence HPV vaccination rates. It was demonstrated that race was an influencing factor in HPV vaccination rates. There were variances in the HPV vaccination rates between geographic regions. A higher percentage of women who received STD information received the HPV vaccine. Engaging in preventive health behaviors (receiving a gynecological exam in the past 12 months, receiving the Hepatitis B and influenza vaccine, and having a source of health insurance) was associated with higher HPV vaccination rates. This was further confirmed by the binary regression model which demonstrated that engaging in preventive health care behaviors increased the likelihood of receiving the HPV vaccine. The null hypotheses in this analysis were rejected.

The age of the sample was limited to those defined as the “catch-up” group (18-26 years old). The binary regression analysis found age to be a significant factor. As age increased the likelihood of receiving the HPV vaccine decreased. This could be due to the fact that women over the age of 19 were not exposed to the HPV vaccine recommendation as adolescents. The regression model also demonstrated that as the number of sexual partners increased so did the likelihood of receiving the HPV vaccine. This is of concern since there may be a misconception that it is best to receive the vaccine after engaging in sexual intercourse, while the opposite is true.

Receiving STD information from one college/university also increased the likelihood of receiving the HPV vaccine. This should be viewed with caution, since there is no feasible way to evaluate the educational material students received or even if HPV information was included. Knowledge of HPV is considered low among the “catch-up” group. Education may prove
fundamental in the endeavor. This secondary analysis should not be generalized to the entire female college student population. Colleges and universities that participated in the survey were self-selected. This analysis also had the limitation of being dependent on self-reporting.

This analysis offers a broad insight into HPV vaccination rates in a large sample of college women. Exploring barriers to HPV vaccination is useful when making decisions regarding health promotion activities that may decrease disparities. The model’s low pseudo-$R^2$ of .156 is indicative of the fact that only a limited amount of variables that may affect HPV vaccination rates were tested. Increasing HPV vaccination rates depends on constructs, as defined by the Health Belief Model, such as perceived risk, perceived susceptibility, perceived benefits, and cues to action, which this analysis could not explore.
Chapter 5

Discussion

Introduction

The focus of this chapter is to discuss the relevance of the analysis. The HPV vaccine has been shown to be safe and effective in women (Harper, et al., 2004, Goldie, et al., 2011). It is recommended by the CDC that along with delivery of the HPV vaccine to adolescent girls the vaccine be administered to women ages 18-26. This recommendation does not include comprehensive strategies for increased delivery to this group of individuals. Research has shown that even after sexual contact, women may realize the benefits of the HPV vaccine due to the unpredictable behavior of the virus (Elbasha, et al., 2005). This analysis explored several factors that may affect HPV vaccination in college age women. The large sample size (N=68,193) provided by the American College Health Association-National College Health Assessment provided this study with greater sensitivity than previous research when examining HPV vaccination rates and the rates of health behaviors between racial and geographic categories (Bendik, et al., 2011, Caron, et al., 2009, Jones, et al., 2008, Kahn, et al., 2008, Licht, et al., 2099, Marchand, et al., 2012). A representative sample of racial categories of female college students in the United States, excluding Biracial/Multiracial women, was studied. The racial category that had the strongest probability of being under-represented was Biracial/Multiracial (n=40). The binary regression analysis finding in that category did not prove to be statistically significant. The racial category “other” also proves difficult to analyze since there is a lack of definition of that group and a lack of comparison data.
The influence of race on HPV vaccination and gynecological exam rates

In this analysis, 49% of college women received the HPV vaccine, which is higher than the 41% reported by the American Public Health Association in 2012. The ACHA-NCHA survey did not specify how many doses in the three shot series respondents received. It can only be assumed that the students in the current analysis had at least one dose of the vaccine. As a result, a drawback of this analysis is that vaccination series completion rates cannot be provided. The racial category with the highest reported HPV vaccination rate was White/non-Hispanic women (51%). Being a member of an ethnic minority was described by Herzog, et al. (2008) and Cates et al. (2009) as a barrier to HPV vaccination. Conversely, Caskey et al. (2009) showed that race was not an influencing factor. The current study found that there was a statistical significance ($p = .000$) between HPV vaccination rates and race, which is not surprising given the large sample analyzed. Black/non-Hispanic, Hispanic/Latino, Asian/Pacific Islander, American Indian/Alaskan Native/Native Hawaiian and women who described themselves as “other” had lower vaccination rates when compared to White/non-Hispanic women. The racial category Biracial/Multiracial had the highest vaccination rate (60%), but again, the small sample size should make this finding suspect. In this study, all of the other racial categories (excluding Biracial/Multiracial) had a lower likelihood of receiving the HPV vaccine when compared to white women (as determined by the binary logistic regression analysis).

In addition, white women had the highest rate of receiving a gynecological exam in the past 12 months (58%) and being covered by health insurance (96%). This is consistent with the CDC report in 2008 that white women had the highest rate of receiving a Pap smear. It is important to keep in mind that the CDC data concerning Pap smear rates is not limited to women.
between the ages of 18-26. It should be noted that White women have the lowest rate of cervical cancer in the United States (NIH.SEER Data, 2012).

Hispanic/Latino and American Indian/Alaskan Native/Native Hawaiian women had HPV vaccination rates of 46% and 47% respectively. Hispanic/Latino women had a lower likelihood (OR=0.903, 95% CI=0.84-0.971) of receiving the HPV vaccine when compared to White/non-Hispanic women and American Indian/Alaskan Native/Native Hawaiian women were also less likely to receive the HPV vaccine (1.0 vs. OR=0.852, 95% CI=0.73-0.995) compared to White/non-Hispanic women. The American Cancer Society (2012) reported that Hispanic/Latino women have a higher mortality rate due to cervical cancer when compared to white women (3.0 vs. 2.2 per 100,000 women). The United States Department of Health and Human Services (2012) reports that American Indian women have a higher incidence of cervical cancer when compared to all other races (2.8 vs. 2.4 women per 100,000). Furthermore, the mortality rate for this minority is higher when compared to white women (2.3 vs. 4.0 women per 100,000).

American Indian/Alaskan Native/Native Hawaiian women reported a 54% gynecological exam rate and Hispanic/Latino women had a rate of 44%. In 2008, the CDC reported that Hispanic/Latino women had a Pap smear rate of 75.4%. It should again be stressed that CDC data is not limited to women 18-26 years old. The current study demonstrated that 87% of Hispanic/Latino were covered by health insurance which was the lowest percentage among the racial categories. It has been demonstrated that lack of health insurance is a predictor of not having a Pap smear. Therefore, cervical cancers could go undetected in these women (McAlearney, et al., 2010). A comprehensive national statistic regarding the gynecological exam rates of American Indian women was not readily available. Past research has shown that
geographic region was a determinant of the rate of cervical cancer in American Indian women. For example, women from Plains tribes have a higher cervical cancer incidence than those from coastal tribes (Becker, et al., 2008). In this analysis, 90% of American Indian women reported being covered by health insurance. Health behavior statistics in this analysis regarding American Indian women have to be interpreted with caution. The Indian Health Service reports data only for women who are members of federally recognized tribes (Becker, et al., 2008). It was not possible to determine if respondents in this analysis were members of federally recognized tribes.

Black/non-Hispanic women and Asian women had the lowest HPV vaccination rates, 44% and 40%, respectively. Black and Asian women had a lower likelihood of receiving the HPV vaccine when compared to white women in the regression analysis (OR=.744, 95% CI=0.692-0.801 and OR=0.795, 95% CI=0.746-0.847 respectively). Gynecological exam rates for these groups were 53% and 28% which is lower than those reported by the CDC in 2008 (80% and 65.6%, respect for all women). The health insurance coverage rate was 91% for Black and 94% for Asian women in this analysis.

It was demonstrated by Kessels et al (2012), that black women were less likely to receive the HPV vaccine. Licht et al (2010) determined that Black and Asian women were less likely to receive the HPV vaccine when compared to white women. Race was shown by Bendik et al (2011) to be a barrier to HPV vaccination. Disregarding the Biracial/Multiracial category, all the minority races in this analysis, when compared to White/non-Hispanic women, had a lower percentage of HPV vaccination and demonstrated in the logistic regression model, a lower likelihood to receive the HPV vaccine.

Several studies have found that lower cervical cancer screening rates are associated with minority status and lower socioeconomic status. In addition, lower socioeconomic status has also
been associated with lacking health insurance (Kahn, et al., 2008, Rodriques, et al., 2005, Solomon, et al., 2007, Swan, et al., 2003). In this analysis, having health insurance, most notably being covered by parental insurance versus having no insurance coverage (OR=1.845, 95% CI=1.689-2.016), increased the likelihood of receiving the HPV vaccine. Insurance coverage has also been linked to increased gynecological exam rates (CDC, 2009). It was not possible to establish the students’ or parents’ socioeconomic status, which is a limitation of the current study.

Educational status has also been shown to influence cervical cancer screening rates (CDC Surveillance of Health Status in Minority Communities, 2009). In 2009, the CDC reported that approximately 83% of women with some college education received a Pap smear while only 70% of women with only a high school diploma were screened for cervical cancer. Among women with no high school diploma, the screening rate was only 61%. In this analysis, 55% of women received a gynecological exam, which is lower than the CDC reported rate for women with some college education. It should be noted that in this study, gynecologic examination does not imply that a Pap smear was done. Again, the Pap smear rate reported by the CDC includes all women with some college education, not just those 18-26 years of age, which is a limitation of this study in that only college women are included in the analysis.

Women who lack access to Pap testing or are less likely to receive the Pap test may realize the greatest benefit from receiving the HPV vaccine (Brewer, et al., 2007, Harper, et al., 2004, Kahn, et al., 2008). In this analysis, Black/non-Hispanic and Asian/Pacific Island women had the lowest gynecological exam rate (44% and 28%, respectively), despite having high insurance coverage rates (91% and 94%, respectively). Since Black and Asian women had low gynecological exam rates they may gain additional benefit from receiving the HPV vaccine.
Hispanic/Latino women could also realize an increased benefit from HPV vaccination. In the present study, 46% of Hispanic women received the HPV vaccine and only 44% received a gynecological exam in the past 12 months. Hispanic/Latino women in this analysis had the lowest percentage of health insurance coverage (87%). While the HPV vaccine does not negate the need for future gynecological exams, vaccination may offer some protection to women who forgo gynecological exams. Changing Pap smear recommendations may also impact the rate at which college women seek gynecological exams. The new recommendation for average risk women is not to begin Pap testing until the age of 21, or 3 years after engaging in sexual intercourse, compared to the previous recommendation that women begin Pap testing at the onset of sexual intercourse or at 18 years of age (American Cancer Society, 2012). This may impact future data on gynecological exam rates. It will take at least five years to obtain data based on the new recommendations. Data on cervical cancer rates even after HPV vaccination will not be available for decades. It has yet to be determined if the HPV vaccine will maintain its full effectiveness over an extended amount of time or if a booster vaccine will be necessary (Chang, et al., 2009, Goldie, et al., 2003).

Creating HPV vaccination programs that concentrate on single racial/cultural groups could help lessen disparities in rates (Kessels, et al., 2012). Evaluation of community needs is not limited to racial categories; socioeconomic factors, cultural beliefs, and past relationships with health care providers all play a role in increasing the levels of preventive care. Increasing HPV vaccination in college age women could further decrease cervical cancer rates in the United States (Harper, et al., 2004). It should be recognized that socio-demographics of college women play a role in decisions they make regarding preventive care. There is a need to focus research on low income women, lack of insurance and access to health care be an indicator for increased
health disparities. Studies have shown lower socio-economic status was found to be a predictor of not receiving the HPV vaccine (Brewer and Fazekas, et al., 2007, Fazekas, et al., 2008, Kahn, et al., 2007).

**The importance of provider recommendation**

Provider recommendation has also been shown to increase the likelihood of HPV vaccination (Brewer, et al., 2007, Colgrove, 2006, Herzog, et al., 2008, Keating, et al., 2008, Kessels, et al., 2012, Marchand, et al., 2012, Rosenthal, et al., 2011). HPV vaccine acceptance increases in young women when their health care providers recommend it (Keating, et al., 2008, Zimet, 2006). When women are not in contact with health care providers, important information regarding the HPV vaccination and the protection it affords is not given. The systemic review on HPV vaccine acceptability prepared by Brewer and Frazekas (2007) demonstrated that lack of physician recommendation is a barrier to vaccination. Marchand et al (2012) reported that 100% of the women who received the HPV vaccine had done so due to a health care provider recommendation; the sample (N=178) in this study was mostly Hispanic women.

In this analysis it was found that there was statistical significance ($p=.000$) in HPV vaccination rates between women who received a gynecological exam in the past 12 months and those who did not. A higher percentage of women received the HPV vaccination (55%) when they had a gynecological exam in the past 12 months, and 43% of women received the vaccine when they did not have a gynecological exam in the past 12 months. The binary regression demonstrated that the likelihood of receiving the HPV vaccine increased nearly two fold when a woman received a gynecological exam (OR=1.936, 95% CI=1.868-2.007).

Physicians also are an educational source for the importance of vaccination. Expanded research on physician recommendation is warranted. Keating et al (2008) demonstrated that
physicians face barriers in the recommendation of the HPV vaccine. Physicians found low reimbursement rates were a barrier to recommendation in a low income geographic region (Keating, et al., 2008). Investigation focusing on physician HPV vaccine recommendations in student health centers could provide insight into barriers faced in recommendations to college women. Increased research regarding provider-patient educational strategies is also warranted. Strong endorsement from the medical community is needed in the promotion of vaccination.

Endorsement of the HPV vaccine by providers is linked to acceptance of the vaccine by medical professional organizations (Raley, et al., 2004, Slomovitz and Bodurka, 2007). Limited access to medical care is a barrier to HPV vaccination (Brewer, et al., 2007, Kessels, et al., 2012). It is important to realize that provider patient relationships are complex and non-standardized HPV vaccine recommendation in college age women makes it difficult to predict if recommendations occur. Physicians reported that discussing STDs with parents may be uncomfortable, thus missing the opportunity to provide the vaccine before they reach adulthood (Kating, et al., 2008, Kessels, et al., 2012). Physician discomfort with the topic of STD’s may also be present when caring for young women.

*Past vaccination status and HPV vaccination*

Exploring past vaccination demonstrated in the binary regression analysis that if women received the Hepatitis B vaccine and the influenza vaccine the likelihood that they would receive the HPV vaccine increased (OR=4.1, 95% CI=3.796-4.428 and OR=2.553, 95% CI=2.465-2.643 respectively). Hepatitis B vaccination series is often required for college matriculation; it was not surprising that 92% of women received the series in this analysis. The study found that 52% of women who received the Hepatitis B vaccine received the HPV vaccine. Conversely, when women did not receive the Hepatitis B vaccine, only 17% of them received the HPV vaccine.
Influenza vaccination rates were much smaller than Hepatitis B vaccination rates. Only 37% of respondents received the influenza vaccine. Only 24% of women in the study received both the influenza and HPV vaccine. What is interesting is that 64% of women that received the influenza vaccine also received the HPV vaccine. Engaging in preventive health behaviors (gynecological exams, previous vaccination, and having a source of health insurance) increases the likelihood of receiving the HPV vaccine.

*Age and number of sexual partners and the effect on HPV vaccination*

The binary regression demonstrated that age was statistically significant ($p=.000$); as age increased, the likelihood of having the HPV vaccination decreased. This may be due to the fact that the vaccine was approved in 2006, therefore women between the ages of 19-26 were not exposed to the recommendation to receive the vaccine as 12-year-olds. In 2011, 28% of 13-17 year old girls received all three doses of the vaccine (CDC, 2012). Even if women in the study were exposed to the vaccination recommendation there is a possibility that they did not receive it. In this analysis, 61% of the respondents did not receive the vaccine, which indicates that progress can be made to increase the HPV vaccine rate among the “catch-up” group.

An increase in the number of sexual partners also proved to be statistically significant in the increase of HPV vaccination ($p=.000$) in the binary regression analysis. Caskey et al (2009) showed that a lack of first sexual contact was a barrier to HPV vaccination. Several studies demonstrated that as the number of sexual partners increased the likelihood of receiving the HPV vaccine (Bendik, et al., 2011, Caskey, et al., 2009, Jones, et al., 2008). The HPV vaccine offers the greatest protection against cervical cancer when given before sexual contact. There may be a misconception among college women that once they engage in sex they should get the HPV
vaccine. This potential conviction among young women should be reversed. Promoting the vaccine before sexual contact should be the goal.

Geographic region and HPV vaccination

There was a statistical significance difference in the HPV vaccination between geographic regions. The Northeast region of the United States had the highest rate of HPV vaccination at 55%. The Southern region had a vaccination rate of 49%, and both the Midwest and Western regions had a vaccination rate of 45%. Women who attended college in the Northeast were more likely to receive the HPV vaccine when compared to the other geographic regions. It was curious that the Midwest region had the highest percentage of women who received a gynecological exam in the past 12 months yet had a lower likelihood of HPV vaccination when compared to the Northeast (OR=.766, 95% CI=.733-.800). This analysis used only the four board regions of the US as defined by the US Census Bureau. This is a limitation of this analysis. It would be more useful to be able to break down geographic region further by state, and even more so by rural and urban areas. Generalizations of HPV vaccination by region should be avoided. Comparison with this analysis data and future research with more defined regions may prove to be fruitful.

Caskey et al., (2009) found no significance between HPV vaccination and geographic region. Current studies which had small sample sizes that were located in varying regions of the United States had different findings regarding the acceptance of the HPV vaccine and how many women have received the vaccine (Allen, 2009, Baer, et al., 2000, Bendik, et al., 2011, Caron, et al., 2009, D’Urso, et al., 2007, Marchand, et al., 2012). Studies such as “HPV Vaccine Acceptability in a Rural Southern Area” (2008) were able to look at a specific rural community and gain information pertinent to that explicit community. Continuation of research that isolates
individual communities and then compares that community to a specific region could further add understanding to HPV vaccination barriers.

Receiving STD information and HPV vaccination

Education emphasizing the risk of HPV virus and the benefits gained from HPV vaccination could further decrease cervical cancer rates in the United States. In this analysis, receiving information regarding STD’s from the student’s university was statistically significant ($p=0.005$) in the binary regression analysis. The likelihood of receiving the HPV vaccine increased when students received STD information (OR=1.05, 95% CI=1.01-1.086). There was also statistical significance ($p=0.000$) difference between the women who received and those who did not receive STD information. This was expected with such a large sample size ($N=68,193$). 55% of respondents received STD information from their college/university. Black women had the highest rate of receiving STD information, at 65%, and American Indian/Alaskan Native/Native American women demonstrated the lowest percentage of 50.

There was no way to determine the content of the STD information gathered by the respondents or even if the information contained any educational material regarding HPV. This is a limitation of the study. It would be most useful to be able to evaluate educational information and HPV vaccination rates. There are public service announcements regarding the benefits of the HPV vaccine; what is not known is the frequency or viewership of these television announcements. There are also a number of un-vetted social media informational websites that either promote or denounce HPV vaccination (Ache, et al., 2008). Increased study of informational programming concerning HPV vaccination would be useful. Kelly, et al (2009) found that the information provided by mass media fails to emphasis that HPV is often a symptomless virus until the formation of cervical cancer and that condoms do not guarantee
100% protection from the virus. Study authors point to the need for tailored educational methods regarding HPV (Avis, et al., 2003, D’Urso, et al., 2007, Kahn, et al., 2007, Parson, et al, 2000, Yacobi, et al., 1999). In a 2007 study conducted at a historically black college 64% of students had never heard of the HPV virus (D’Urso, et al., 2007). This was not the case in a large state university in New Hampshire. Approximately 85% of students had heard of the Gardasil® vaccine (Caron, et al., 2009). Greater knowledge of the HPV virus is linked with an increased intent to receive the vaccine (Jones, et al., 2008). Lack of knowledge concerning the HPV virus and its related diseases is a barrier to vaccination (Blumenthal, et al., 2008, Brewer, et al, 2007, Rosenthal, et al., 2011). Specific educational interventions regarding the benefits of the HPV vaccine could be practical in decreasing cervical cancer disparities between minority groups. Increased research exploring HPV virus education in college age women is necessary.

This study was limited to exploring the barriers, demographics and health behaviors related to HPV vaccination rates. The pseudo-$R^2=.156$ did not provide a large explanatory value in the binary regression model. This analysis could not evaluate the entirety of the Health Belief Model’s constructs. It would be desirable to explore the barriers to HPV vaccine along with perceived susceptibility, perceived severity, perceived benefits, and cues to action, arguably all of which contribute to an individual’s motivation to receive the HPV vaccine (Brewer, et al., 2007, Nadarzynski, et al., 2012, McAlearney, et al., 2010). Maintaining a large sample size of college age women and exploring all the Health Belief Model’s constructs would be of use, although it may be unrealistic.

**Strengths of the analysis**

The strength of this research is its large sample size. Research with a sample size over 1,500 which explores HPV vaccination rates and barriers to vaccination was not readily
available. Information gathering behavior is another dimension; “did you receive information regarding STD’s” that universities use to gauge their educational efforts was unprompted. Furthermore, data regarding rates of gynecological exams in college women is useful comparing HPV vaccination among diverse groups of women since Pap smears which screen for cervical cancer and the HPV vaccine which aims to reduce the incidence. Comparison to Hepatitis B and influenza vaccine was novel.

Limitations of the analysis

A limitation of secondary data analysis is that results cannot be generalized to all college age women. This is due to the fact that institutions that participate in the National College Health Assessment are self-selected. Secondary analysis is limited to the data set available. With the dependent variable “Have you received the HPV vaccine?” one has to assume at least one dose of the vaccine. There are no questions included in the survey that asks respondents how many doses of the series they received or if they completed the series. Another limitation is that independent variable, “Have you received information on the following topic from your college or university, sexually transmitted disease/infection?” is not specific to HPV and there is no way to evaluate the information received. Geographic regions are also defined in four board regions which does not take into account the difference between vaccination rates in rural and urban areas. While general barriers -- for example, lack of insurance and/or lack of gynecological exams -- can be indicated, it is impossible to know the circumstances that affected the variables. The entire survey relies on self-reporting which is a limitation of survey analysis.

Self-reporting dealing with sensitive issues, such as the number of sexual partners, may cause respondents to answer in a socially acceptable way instead of being honest. There is no way to gauge the veracity of the answers reported by the respondents. Surveys such as this one
also rely on the introspective ability of the respondents. Questions dealing with time frames, such as “Have you had a gynecological exam in the past 12 months,” may lead the respondents to answer the question incorrectly because they inaccurately remember. There is even the danger that respondents answer inaccurately intentionally. Response bias, the tendency to answer a certain way, can cause inaccurate responses. Behavioral researchers nonetheless must heavily rely on self-reporting, even knowing that there are multiple limitations in doing so.

**Conclusion**

In this secondary data analysis race, age, number of sexual partners, lacking a gynecological exam in the past 12 months, not receiving the Hepatitis B and influenza vaccine, and not having a source of health insurance, were shown to be possible barriers to HPV vaccination in college women. HPV vaccination in this analysis was influenced by geographic location, but this should be viewed with caution since it could not determine which state the respondents were from. It would have been even more useful if geographic location could be broken down by rural or urban location. Receiving STD information from one’s college was statistically significant in the binary regression model \( p \leq 0.01 \). There is no way to determine the content of the STD information received by the respondents. The model had a low explanatory value, as determined by the pseudo-\(R^2=0.156\). This is most likely due to the fact that among the limited number of barriers that were explored, perceived risk, perceived susceptibility, perceived severity, and cues to action could not be determined. This analysis does provide a large sample that gives greater insight into HPV vaccination rates among racial categories and the influence of health behaviors.

Increasing the acceptance of preventive health behaviors in college age women may serve as an impetus to increase HPV vaccination rates. Racially sensitive health promoting activities
could benefit colleges that wish to decrease health disparities in their student population. Keeping a wide focus of women’s health, such as promoting gynecological exams, not only affords women the opportunity to receive a HPV vaccine recommendation but also other preventive health care such as Pap smears and other missed vaccinations. Increasing the knowledge of the HPV virus and vaccine may prove essential to increasing vaccination rates in college age women.
Chapter 6

Conclusion

Introduction

In this study of college women, White/non-Hispanic women had a higher HPV vaccination rate than the minority women. Binary logistic regression demonstrated minority women had a lower likelihood of receiving the HPV vaccine. Health behaviors, such as receiving a gynecological exam in the past 12 months and receiving the Hepatitis B and influenza vaccines, increased the likelihood of receiving the HPV vaccine. Among the racial categories, White/non-Hispanic women had the highest percentage of receiving a gynecological exam within the past 12 months, receiving the Hepatitis B vaccine, and having a source of health insurance. Promoting preventive health behaviors, such as receiving a regular gynecologic exam and maintaining preventive vaccines, could provide an opportunity to educate women on the benefits of HPV vaccination. The Affordable Care Act (2010) calls for increased health insurance coverage and specifically targets an increase in preventive care. The legislation also targets decreasing health disparities in minority populations. Patient-centered medical homes are considered to be an avenue for increasing the amount of preventive care offered. Incentives are offered for the increased use of electronic medical records (EMRs) by health providers. Currently the medical home model is being explored, and EMRs are seeing increased implementation. Future research will surely focus on medical outcomes if there is widespread implementation of medical homes and EMRs (Patient Centered Homes, Health Affairs, 2010). It would be of interest to follow HPV vaccination rates of the “catch-up” group after the new legislation is fully realized. State-by-state evaluations may be necessary due to the fact the individual states may enact new legislation in unique ways. Currently EMRs are not contained in
a centralized data base, which means the portability of medical records is not fully available, potentially problematic if patients seek treatment in different hospitals or even states (Patient Centered Homes, Health Affairs, 2010).

Unlike the United Kingdom and Australia, there is not a centralized adult vaccine registry in the U.S. Tracking adult vaccination rates can prove difficult. People in the United States often seek care in multiple health care venues (i.e., a college student may have a vaccine record with a primary care physician in their home town, and a vaccine record in the student health department at their university). The evolution of the EMR may see the formation of a comprehensive medical record, but that is yet to come to fruition.

**Policy Implications**

Future preventive measures that may be proposed due to the Affordable Care Act (2010) includes increasing adult vaccination rates. The goal of expanding preventive health measures is to reduce health disparities, such as cervical cancer. Preventive health care expansion may advocate the HPV vaccine in women age 26 and younger. The President’s Cancer Panel (2012) created an HPV vaccine advisory board and has indicated that increasing HPV vaccination rates is a priority. However, the committee is currently focused on adolescent girls aged 11-12. If centralized and coordinated care of the medical home model comes to fruition, preventive services for adult HPV vaccination may be a focus. The Affordable Care Act (2010) also calls for mandated health insurance coverage. As of September 23, 2010, this act mandated that the Department of Health and Human Services require that new health plans include coverage for the HPV vaccine. Presently it is unclear whether all socioeconomic groups will benefit from this new legislation. Hypothetically, increased insurance coverage could increase HPV vaccine rates in women that previously did not have health insurance. Increased use of electronic medical
record along with coordinated preventive care could provide physicians with the information and the opportunity they need to suggest vaccination, i.e., “I see that you did not receive the HPV vaccine, here are the benefits and risks.” Physician recommendation in the “catch-up” group is a vital component of the effort to increase HPV vaccination rates. Additionally, the development of a Community Preventive Services Task Force, also included in the Affordable Care Act (2010), has the primary goal to increase preventive health services. One focus of the task force is to expand care for women.

**Conclusion**

In this analysis black, Hispanic, and Asian college women ages 18-26 all demonstrated lower HPV vaccination rates when compared to white women. Tailoring health promotion activities to specific racial populations may help lessen disparities in HPV vaccination rates. Student health departments could tailor promotion activities to their specific student populations. Advocacy of increased provider visits (i.e., gynecological exams) and other preventive health services (such as influenza vaccine drives) in the female student population could be a window of opportunity for increased HPV education and vaccination. Acknowledgment that minorities have lower HPV vaccination rates and gynecological exam rates allows for the recognition that specialized health promotion activities may be an avenue for designing educational strategies to lessen disparities. Considering that Healthy People 2020 calls for a HPV vaccination rate of 80% in women, policy makers and the medical community may decide that strategies to increase the vaccination rate in women 18-26 years of age is warranted. This research aimed to provide an understanding of HPV vaccination rate disparities and potential barriers, which is important when formulating strategies to increase vaccination rates.
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Appendix A

Center for Disease Control and Prevention Cervical Cancer Screening for the Average-Risk Female
### Cervical Cancer Screening Guidelines for Average-Risk Women

<table>
<thead>
<tr>
<th>American Cancer Society (ACS), American Society for Colposcopy and Cervical Pathology (ASCCP), and American Society for Clinical Pathology (ASCP)</th>
<th>U.S. Preventive Services Task Force (USPSTF)</th>
<th>American College of Obstetricians and Gynecologists (ACOG)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>When to start screening</strong>&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Age 21. Women aged &lt;21 years should not be screened regardless of the age of sexual initiation or other risk factors. (Strong recommendation)</td>
<td>Age 21. (A recommendation) Recommend against screening women aged &lt;21 years. (D recommendation)</td>
</tr>
<tr>
<td><strong>Statement about annual screening</strong></td>
<td>Women of any age should not be screened annually by any screening method. (Strong recommendation)</td>
<td>Individuals and clinicians can use the annual Pap test screening visit as an opportunity to discuss other health problems and preventive measures. Individuals, clinicians, and health systems should seek effective ways to facilitate the receipt of recommended preventive services at intervals that are beneficial for the patient. Efforts also should be made to ensure that individuals are able to seek care for additional health concerns as they present.</td>
</tr>
<tr>
<td><strong>Screening method and intervals</strong>&lt;sup&gt;b&lt;/sup&gt;</td>
<td>21-29 years of age Every 3 years. (Strong recommendation)</td>
<td>21-29 years of age Every 3 years. (A recommendation)</td>
</tr>
<tr>
<td>Cytology (conventional or liquid based)</td>
<td>30-65 years of age Every 3 years. (Strong recommendation)</td>
<td>30-65 years of age Every 3 years. (A recommendation)</td>
</tr>
<tr>
<td>HPV co-testing (cytology + HPV test, administered together)</td>
<td>21-29 years of age HPV co-testing should not be used for women aged &lt;30 years. Every 5 years. (Strong recommendation)</td>
<td>21-29 years of age HPV co-testing should not be used for women aged &lt;30 years. Every 5 years. (Strong recommendation)</td>
</tr>
<tr>
<td>Primary HPV testing&lt;sup&gt;c&lt;/sup&gt;</td>
<td>30-65 years of age For women aged 20-65 years, screening by HPV testing alone is not recommended in most clinical settings. (Weak recommendation)</td>
<td>For women who want to extend their screening interval, HPV co-testing every 2 years is an option. (A recommendation)</td>
</tr>
<tr>
<td><strong>When to stop screening</strong></td>
<td>Aged ≥65 years with adequate screening history. (A recommendation)</td>
<td>Aged ≥65 years with adequate screening history. (A recommendation)</td>
</tr>
<tr>
<td><strong>Screening post-hysterectomy</strong></td>
<td>Women who have had a total hysterectomy (removal of the uterus and cervix) should stop screening. (A recommendation)</td>
<td>Women who have had a hysterectomy (removal of the cervix) should continue screening according to guidelines. (Strong recommendation)</td>
</tr>
<tr>
<td><strong>The need for a bimanual pelvic exam</strong></td>
<td>Not addressed in 2012 guidelines but was addressed in 2002 ACS guidelines. (A recommendation)</td>
<td>Addressed in USPSTF ovarian cancer screening recommendations (draft). (A recommendation)</td>
</tr>
<tr>
<td><strong>Screening among those immunized against HPV 16/18</strong></td>
<td>Women at any age with a history of HPV vaccination should be screened according to the age specific recommendations for the general population.</td>
<td>The possibility that vaccination might reduce the need for screening with cytology alone or in combination with HPV testing is not established. (D recommendation)</td>
</tr>
</tbody>
</table>
Appendix B

MEETING SUMMARY
PRESIDENT’S CANCER PANEL
ACHIEVING WIDESPREAD HPV VACCINE UPTAKE

Arlington, VA September 13, 2012
Achieving Widespread HPV Vaccine Uptake September 13, 2012

The President’s Cancer Panel held the second workshop in its 2012–2013 series, Accelerating Progress in Cancer Prevention: The HPV Example, on September 13, 2012, in Arlington, Virginia. During this workshop, entitled Achieving Widespread HPV Vaccine Uptake, invited participants discussed factors influencing uptake of the human papillomavirus (HPV) vaccine, gaps in knowledge related to vaccine use, and potential strategies to achieve widespread adoption of the vaccine. Representatives from government, academic, nonprofit, and private sectors were present, including an HPV-related cancer survivor, pediatricians, other physicians, a pharmacist, and experts in medical decision making, epidemiology, health services research, health communications, and social marketing. The group emphasized the need to generate enthusiasm for the vaccine among providers and the public in order to increase uptake. Strategies for enhancing communication and increasing access to the vaccine were discussed.

Participants presented the most recently available data on HPV vaccine uptake in the United States and the results of research on factors influencing vaccine-related decision making. Although there is variability in vaccine uptake among geographic regions and racial/ethnic populations, overall vaccination rates have plateaued among U.S. girls in recent years and adoption remains low among boys. Higher adoption rates for other adolescent vaccines (i.e., Tdap and meningococcal vaccines) suggest there is an opportunity to increase HPV vaccination rates. Participants viewed providers as key influencers of vaccine uptake and discussed the need to educate providers about HPV-associated diseases (particularly non-cervical cancers) and the effectiveness of the vaccine in preventing these diseases. Important messages to communicate to providers are that the vaccine prevents cancer and is most beneficial for younger, rather than older, adolescents. Well-designed decision aids may foster pediatrician confidence and skill in communicating with parents and patients about the vaccine. Some participants suggested that campaigns targeting the general public also may be useful for enhancing awareness of and support for the vaccine. The potential of social marketing for disseminating positive communication messages was discussed, as was the power of narratives for illustrating the burden of HPV-associated disease and the effectiveness of the vaccine in preventing suffering associated with these diseases. Workshop participants also discussed system-level challenges to vaccine adoption. Optimally, the HPV vaccine would be promoted as part of a broader adolescent health platform that includes other adolescent vaccines and preventive care. Incentives could be established to encourage physicians to promote HPV vaccines in this context; however, participants acknowledged that adolescents often do not receive regular care from pediatricians or family physicians. Making the vaccine available at locations frequented by adolescents may help improve uptake of the vaccine, including initiation and completion of the series. School-based programs represent one potential venue for vaccination, although significant policy and logistical barriers exist in the United States. Another option is to allow other providers, such as dentists and pharmacists, to administer one or more doses of the vaccine. Robust infrastructure, including electronic health records and vaccine registries, could help link the components of the so-called medical neighborhood of vaccine providers and also facilitate reminders and implementation of other evidence-
based approaches for enhancing vaccine uptake and series completion. Reminders and other system interventions have been effective in increasing uptake of other vaccines. Throughout the day, the group discussed challenges of a three-vaccine series and some of the differences between those who initiate versus complete the series. Recommendations will reflect these differences. The Panel will summarize findings and recommendations from this meeting, along with the other meetings in the series, in its 2012–2013 Annual Report to the President of the United States.
Appendix C

Brochure

Used by the American College Health Association-National College Health Assessment for Participant Recruitment
Do you have a comprehensive picture of your students’ health?

College students are a diverse yet distinct population with specific health risks and needs. Having current, relevant data about your students’ health can only help you to enhance campuswide health promotion and prevention services.

That’s why we created the National College Health Assessment (NCHA) — a nationally recognized research survey that can assist you in collecting precise data about your students’ health habits, behaviors, and perceptions.

THE SURVEY WITH THE BROADEST REACH

While other health surveys of college students cover a single topic area, the ACHA-NCHA offers a way for you to map the widest range of health issues:

- Alcohol, tobacco, and other drug use
- Sexual health
- Weight, nutrition, and exercise
- Mental health
- Personal safety and violence

If you need to collect data about your students’ smoking habits, contraception use, mental health issues, relationship difficulties, sexual behaviors, exercise habits, preventive health practices, and perceptions of drug and alcohol use, the NCHA can assess students on all of these topics and many, many more — all in one convenient survey!
FLEXIBILITY — HAVE IT YOUR WAY

The NCHA is here to meet your needs — you determine the primary purpose, surveying method, sample size, target population, and time period. You can choose to conduct your survey on paper or online and whether to administer the survey in the spring or fall.

For the web-based survey, you also have the option of adding up to five additional questions that you can customize to meet your campus needs, to be inserted at a nominal surcharge.

While you handle this upfront work, we do the rest. Once you have made your choices, we’re with you every step of the way.

IT’S ALL ABOUT THE STUDENTS

We have made sure that the NCHA does not place a burden on your students as well. It’s simple, easy to complete, and can be distributed in several ways convenient to a busy student’s schedule. The survey takes about 30 minutes to complete.

The survey is completely confidential — students’ email addresses or names are never attached to their responses.

Ultimately, the information that you acquire through the NCHA can only help to advance your students’ health, wellness, and overall satisfaction with their college learning and social experience.

A GOOD VALUE FOR YOUR BUDGET

The costs to implement the NCHA are much lower than you would expect, especially in comparison to other data collection projects. It’s so cost-effective that you can implement the survey several times, to evaluate campus health initiatives and map your student health data over an extended period.

<table>
<thead>
<tr>
<th>PARTICIPATION AND PROCESSING FEES</th>
<th>ACHA Member Institution</th>
<th>Nonmember Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Web Survey</td>
<td>Paper Survey</td>
</tr>
<tr>
<td>Participation Fee</td>
<td>.20 ea</td>
<td>.40 ea</td>
</tr>
<tr>
<td>Nonresponder Contact Fee</td>
<td>.10 ea</td>
<td>N/A</td>
</tr>
<tr>
<td>Processing Fee</td>
<td>.25 ea</td>
<td>.50 ea</td>
</tr>
<tr>
<td>Reports Package (5 products):</td>
<td></td>
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<tr>
<td>Institutional Data File, Data</td>
<td>$300</td>
<td>$300</td>
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<tr>
<td>Report, and Executive Summary,</td>
<td></td>
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<tr>
<td>plus a Reference Group Report</td>
<td></td>
<td></td>
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<tr>
<td>and Executive Summary</td>
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</tbody>
</table>

Participation fees are based on the number of student contacts (for the web survey) or the number of scan forms (for the paper survey). Processing fees are based on scanning and/or compiling completed survey data. Additional custom questions may be added for a fee.
Students reported that parents, the Internet, and friends are their top sources for health information. The estimated Body Mass Index (BMI) has 65% students classified as a healthy weight, and 90% classified as overweight or obese.


JOIN A GROWING PARTICIPANT BASE

It’s no wonder that survey participation has more than tripled since the survey’s first administration in Spring 2000. More than 300,000 students at 300+ colleges and universities across the country have already taken the survey. The NCHA has been used by two-year and four-year public and private institutions from varied geographical regions, Carnegie Foundation Classifications, and campus settings.

National media, government policymakers, and prominent public health and higher education organizations have repeatedly cited NCHA data in articles, proposals, and presentations. What started as a pilot program in 1998 has now grown into an established and well-regarded tool that presents a rich picture of college student health.

HOW YOU CAN USE THE DATA

With the NCHA, you can determine the most significant health priorities and trends of your student body.

With your survey data, you can:

- Identify the most common health and behavior risks affecting students’ academic performance.
- Design evidenced-based health promotion programs with targeted educational and environmental initiatives.
- Create social norms marketing campaigns by comparing students’ actual behaviors to their perceptions about peer behavior.
- Allocate monetary and staffing resources based upon defined needs.
- Provide needs assessment data for campus and community task forces on sexual assault, alcohol use, eating disorders, etc.
- Have readily available graphs and data for policy discussions and presentations with faculty, staff, administration, and board members.
- Impact the campus culture by opening a dialogue about health with students and staff.
- Develop proposals to secure grant funding to expand or develop programs.
- Evaluate your programming efforts by conducting repeat administrations of the survey.

There are so many additional ways the data can be of service to your campus:

- For faculty to present in social sciences, health, communications, and research classes.
- For students to gain hands-on experience working with and analyzing data.
- For campus and local media to cite in articles and editorials.
- For administration to use in presentations for prospective students and parents and for freshmen orientation.
- For marketing professionals to draw on for promotional materials.

*Because individual institutions self-select to participate, ACHA-NCHA Reference Group data are not nationally generalizable.*
WHAT YOU NEED TO KNOW TO GET STARTED

Interested in participating in the survey? These steps will give you a general idea about how to get started.

- Decide the primary purpose of the survey. Do you want to survey for a general health assessment, a needs assessment, for comparison to a national sample, for program planning, or for pre-test and post-test evaluation?
- Determine your target population. Do you want to survey freshmen, athletes, graduate students, commuters, another subset, or all students?
- Identify sources of support and campus resources available — administrators, health center staff, other student affairs staff, IT staff, academic departments, and graduate students. The NCHA can be a great opportunity for campuswide collaboration.
- Decide if you want to survey in the fall or spring. The fall survey asks students questions based on “the last 12 months”; the spring survey asks students the same questions based on “the last school year.”
- Specify the sampling strategy and surveying method you want to use: survey all students (web or paper); survey randomly selected students (web or paper); survey students in randomly selected classrooms (paper). We can help you review the pros and cons of each and figure out your most effective choice.
- Determine if you want to offer any incentives to increase your response.
- Decide if you want to add any extra questions specific to your campus.
- Based upon your selected sample size and surveying method, complete the order form and send in initial payment for the total number of students to be surveyed and the reports package.

IF YOU CHOOSE THE WEB SURVEY:

- Email us a spreadsheet file of student email addresses, your letter of invitation/consent, your preferred subject line, and your reminder letter for non-responders.
- Send a copy of your Institutional Review Board (IRB) approval and/or administrative approval.
- Complete and send in the Demographic Survey.
- We handle the rest — we email the invitation and reminder invitation to your students, collect and download the data, and generate your data reports.

IF YOU CHOOSE THE PAPER SURVEY:

- Send a copy of your Institutional Review Board (IRB) approval and/or administrative approval. We will ship your requested printed surveys.
- Distribute the survey based upon your sampling technique — in randomly selected classrooms or to randomly selected students.
- Collect the completed surveys and ship them to us.
- Complete and send in the Demographic Survey.
- We handle the rest — we scan the surveys, download the data into our statistical program, and generate your data reports.
YOUR DATA REPORTS PACKAGE

When you complete the survey process and administrative requirements, we will send you:

- your institutional data file — statistical program file with built-in codebook for your own analysis
- a comprehensive institutional report — frequency distribution for every survey question by gender and for all subjects
- your institutional executive summary — highlights of your results

When the survey period has ended, we will send you:

- the aggregate reference group report and reference group executive summary for your survey period — so you can compare your data to the national sample

The average turnaround time for the return of your institutional results is only six weeks or less!

FOR MORE INFORMATION

Visit www.acho-ncha.org for detailed information about the survey and how to participate. You will also find online:

User's Manual — Describes in detail how to plan and carry out your survey research, conduct random sampling, and manage follow-up.

Frequently Asked Questions — Answers your IT and sampling questions for the web-based survey.

Data Highlights and Reports — Presents graphs, articles, and comprehensive reports.

Or, call the ACHA-NCHA Program Office at (410) 859-1500.

For more than 85 years, the American College Health Association has been the nation’s principal advocate and leadership organization for college and university health. We are dedicated to strengthening the efforts of college health professionals, institutions of higher education, and other key stakeholders working in the field to promote and maintain the health and wellness of the nation’s more than 16 million college students. Ongoing efforts such as the National College Health Assessment help us to advocate for student health by integrating the critical role of college health into the mission of higher education.
Appendix D

Approval Letter and Guidelines for the Use of Secondary Data
December 22, 2011

Timmerie Cohen  
10710 Green Mount Road  
Richmond, VA 23238  

Dear Timmerie,

Thank you for submitting a request to utilize ACHA-NCHA data in your study, “Identifying Information Gathering Behavior and Vaccination Rates for the Human Papillomavirus in Female College Students.” Your request has been approved with a modification to your proposed title and hypotheses as the ACHA-NCHA data contain no information about perception, knowledge, nor awareness of HPV vaccination. Enclosed you will find a CD containing Fall 2008, Spring 2009, Fall 2009, and Fall 2010 ACHA-NCHA II Reference Group datasets. Both institutional and student identifiers have been removed from the files.

I have enclosed a copy of our data use guidelines and agreement for your information. Your signed copy is on file in my office. Please note that additional studies using the ACHA-NCHA data acquired through this request require submission of a new data use request to the ACHA-NCHA Program Office.

As stated in the agreement, we would appreciate a copy of any final products that result from your research.

Please don’t hesitate to contact me if you have any questions.

Best of luck in your efforts,

Mary Hoban, PhD, CHES  
Director, ACHA-NCHA Program Office

Enclosure: ACHA-NCHA Data Use Guidelines and Agreement
Data Use Guidelines

The ACHA-NCHA data contain information about high-risk behaviors, and all data are confidential. ACHA will not release data to any institution, nor will it release data sets where it is possible to identify any participating schools. Individuals who are granted access to any ACHA-NCHA data must adhere to ACHA’s data use guidelines, which follow. Failure to sign or to adhere to the attached agreement will result in immediate termination of data use privileges.

The accuracy of the users’ statistical analyses and the findings they report are not the responsibility of the American College Health Association. ACHA shall not be held liable for improper or incorrect use of the data.

Data Use Agreement

Signing this agreement does not guarantee your request will be approved; however, this section must be complete for your application to be considered.

By signing below, I agree to the following:

- I will reference the American College Health Association when reporting any data obtained from the ACHA-NCHA utilizing the following standard format (items in Arial font are specific to the data you receive and must be completed appropriately):
  - American College Health Association. American College Health Association-National College Health Assessment, Survey Period(s) [computer file]. Baltimore, MD: American College Health Association [producer and distributor]; (YYYY-MM-DD of distribution).
- I will grant access to ACHA-NCHA data to only those individuals specified in this Data Use Request Form. Should the need to grant access to additional individuals arise, I will contact the ACHA Research Director immediately.
- If my institution requires, I will obtain all necessary Institutional Review Board (IRB) approval for secondary data analysis prior to beginning my research, and I will provide ACHA with appropriate documentation of IRB approval.
- I will provide ACHA with any final products produced using ACHA-NCHA data, which include but are not limited to: professional journal manuscripts, professional conference presentations, student theses/dissertations, book chapters, policy documents, fact sheets, and brochures.

Signed copy on file at ACHA, 10/24/11
Appendix E

Definition of Geographic Location

United State Census Bureau Map
**U.S. Census Bureau**

*Census Bureau Regions and Divisions with State FIPS Codes*

**Region 1: Northeast**

- **Division 1:** New England
  - Connecticut (09)
  - Maine (23)
  - Massachusetts (25)
  - New Hampshire (33)
  - Rhode Island (44)
  - Vermont (50)

- **Division 2:** Middle Atlantic
  - New Jersey (34)
  - New York (36)
  - Pennsylvania (42)

**Region 2: Midwest**

- **Division 3:** East North Central
  - Indiana (18)
  - Illinois (17)
  - Michigan (26)
  - Ohio (39)
  - Wisconsin (55)

- **Division 4:** West North Central
  - Iowa (19)
  - Kansas (20)
  - Minnesota (27)
  - Missouri (29)

**Region 3: South**

- **Division 5:** South Atlantic
  - Delaware (10)
  - District of Columbia (11)
  - Florida (12)
  - Georgia (13)
  - Maryland (24)
  - North Carolina (37)
  - South Carolina (45)
  - Virginia (51)
  - West Virginia (54)

- **Division 6:** East South Central
  - Alabama (01)
  - Kentucky (21)
  - Mississippi (26)
  - Tennessee (47)

- **Division 7:** West South Central
  - Arkansas (05)
  - Louisiana (22)
  - Oklahoma (49)
  - Texas (48)

**Region 4: West**

- **Division 8:** Mountain
  - Arizona (04)
  - Colorado (08)
  - Idaho (16)
  - New Mexico (38)
  - Montana (30)
  - Utah (49)
  - Nevada (32)
  - Wyoming (56)

- **Division 9:** Pacific
  - Alaska (02)
  - California (06)
  - Hawaii (15)
  - Oregon (41)
  - Washington (53)

*Prior to June 1984, the Midwest Region was designated as the North Central Region.*
Appendix F

Variable coding, Omnibus Test of Model Coefficients, Model Summary, Hosmer and Lemeshow Test and Contingency Table, and Classification Table
The following table (Table A.1) provides the variable coding used in SPSS 20.

<table>
<thead>
<tr>
<th>Appendix table A.1 Categorical Variables Codings</th>
<th>Frequency</th>
<th>Parameter coding</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td>(3)</td>
</tr>
<tr>
<td>White, non Hispanic</td>
<td>50279</td>
<td>.000</td>
</tr>
<tr>
<td>Black, non Hispanic</td>
<td>3936</td>
<td>1.000</td>
</tr>
<tr>
<td>Hispanic or Latino/a</td>
<td>3957</td>
<td>.000 1.000</td>
</tr>
<tr>
<td>Asian or Pacific Islander</td>
<td>5852</td>
<td>.000 1.000</td>
</tr>
<tr>
<td>American Indian, Alaskan Native, Native Hawaiian</td>
<td>763</td>
<td>.000 1.000</td>
</tr>
<tr>
<td>Biracial or Multiracial</td>
<td>39</td>
<td>.000 1.000</td>
</tr>
<tr>
<td>Other</td>
<td>844</td>
<td>.000 1.000</td>
</tr>
<tr>
<td>Northeast</td>
<td>20000</td>
<td>.000 1.000</td>
</tr>
<tr>
<td>Midwest</td>
<td>13454</td>
<td>1.000</td>
</tr>
<tr>
<td>South</td>
<td>19062</td>
<td>.000 1.000</td>
</tr>
<tr>
<td>West</td>
<td>13154</td>
<td>.000 1.000</td>
</tr>
<tr>
<td>College/university plan</td>
<td>8334</td>
<td>1.000</td>
</tr>
<tr>
<td>Primary source of health insurance</td>
<td></td>
<td>(4)</td>
</tr>
<tr>
<td>Parent’s plan</td>
<td>49441</td>
<td>.000 1.000</td>
</tr>
<tr>
<td>Another plan</td>
<td>4844</td>
<td>.000 1.000</td>
</tr>
<tr>
<td>Do not have health insurance</td>
<td>3051</td>
<td>.000 1.000</td>
</tr>
<tr>
<td>Vaccination/shot: Hepatitis B</td>
<td></td>
<td>(5)</td>
</tr>
<tr>
<td>No</td>
<td>5274</td>
<td>.000</td>
</tr>
<tr>
<td>Yes</td>
<td>60396</td>
<td>1.000</td>
</tr>
<tr>
<td>Vaccination/shot: Influenza</td>
<td></td>
<td>(6)</td>
</tr>
<tr>
<td>No</td>
<td>41177</td>
<td>.000</td>
</tr>
<tr>
<td>Yes</td>
<td>24493</td>
<td>1.000</td>
</tr>
<tr>
<td>Received Info: STD/I prevention</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>29670</td>
<td>.000</td>
</tr>
<tr>
<td>Yes</td>
<td>36000</td>
<td>1.000</td>
</tr>
<tr>
<td>Females last 12 months: Routine gynecological exam</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>29641</td>
<td>.000</td>
</tr>
<tr>
<td>Yes</td>
<td>36029</td>
<td>1.000</td>
</tr>
</tbody>
</table>
The model is statistically significant ($p=.000$). Therefore, the null hypotheses were rejected. Table A.2 demonstrates the Omnibus test provided by SPSS 20.

**Table A.2 Omnibus Tests of Model**

<table>
<thead>
<tr>
<th></th>
<th>Chi-square</th>
<th>df</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step</td>
<td>11150.346</td>
<td>18</td>
<td>.000</td>
</tr>
<tr>
<td>Step 1 Block</td>
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<tr>
<td>Model</td>
<td>11150.346</td>
<td>18</td>
<td>.000</td>
</tr>
</tbody>
</table>

The model summary provided by SPSS 19 provided a large -2 Log likelihood. The pseudo R-squares were also provided. It was understood that pseudo-R squares should be used with caution. (See Table A.3)

**Table A.3 Model Summary**

<table>
<thead>
<tr>
<th>Step</th>
<th>-2 Log likelihood</th>
<th>Cox &amp; Snell R Square</th>
<th>Nagelkerke R Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>79874.772$^a$</td>
<td>.156</td>
<td>.208</td>
</tr>
</tbody>
</table>

*a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.*
It was not surprising that the Hosmer and Lemeshow Test did not suggest goodness of fit. That is common with sample sizes over 13,000. (See Table A.4 and A.5)

**Table A.4 Hosmer and Lemeshow Test**

<table>
<thead>
<tr>
<th>Step</th>
<th>Chi-square</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>18.658</td>
<td>8</td>
<td>.017</td>
</tr>
</tbody>
</table>

**Table A.5 Contingency Table for Hosmer and Lemeshow Test**

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Vaccination/shot: HPV = No</th>
<th>Observed</th>
<th>Expected</th>
<th>Vaccination/shot: HPV = Yes</th>
<th>Observed</th>
<th>Expected</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>5633</td>
<td>5703.080</td>
<td>936</td>
<td>865.920</td>
<td>6569</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>4882</td>
<td>4785.431</td>
<td>1661</td>
<td>1757.569</td>
<td>6543</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>4236</td>
<td>4266.368</td>
<td>2386</td>
<td>2355.632</td>
<td>6622</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>3833</td>
<td>3816.546</td>
<td>2738</td>
<td>2754.454</td>
<td>6571</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>3479</td>
<td>3448.710</td>
<td>3076</td>
<td>3106.290</td>
<td>6555</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>3124</td>
<td>3090.567</td>
<td>3409</td>
<td>3442.433</td>
<td>6533</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>2699</td>
<td>2691.984</td>
<td>3826</td>
<td>3833.016</td>
<td>6525</td>
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<tr>
<td>8</td>
<td></td>
<td>2242</td>
<td>2301.260</td>
<td>4326</td>
<td>4266.740</td>
<td>6568</td>
<td></td>
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<tr>
<td>9</td>
<td></td>
<td>1886</td>
<td>1888.077</td>
<td>4687</td>
<td>4684.923</td>
<td>6573</td>
<td></td>
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<tr>
<td>10</td>
<td></td>
<td>1280</td>
<td>1301.979</td>
<td>5331</td>
<td>5309.021</td>
<td>6611</td>
<td></td>
</tr>
</tbody>
</table>

Table A.6 provides the predicted percentage of cases based on the full logistic regression model.

**Table A.7 Classification Table**

<table>
<thead>
<tr>
<th>Observed</th>
<th>Predicted</th>
<th>Percentage Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vaccination/shot: HPV No</td>
<td>Yes</td>
</tr>
<tr>
<td>Step 1</td>
<td>22435</td>
<td>10859</td>
</tr>
<tr>
<td></td>
<td>11196</td>
<td>21180</td>
</tr>
<tr>
<td>Overall Percentage</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. The cut value is .500
Appendix G

Executive Summary
Executive Summary

Human Papillomavirus: Identifying Vaccination Rates, Barriers, and Information Gathering among College Women ages 18-26

Background

The Center for Disease Control and Prevention recommends the Human Papillomavirus (HPV) vaccine for women up to the age of 26. HPV is the most common sexually transmitted disease (STD) in the United States. The majority of cervical cancers are the result of HPV infection. Women age 20-24 are at the highest risk for HPV infection. The presence of the virus is difficult to detect since HPV is often asymptomatic and the development of cancer can take decades. Increasing the HPV vaccination rate has been of interest to public health authorities. The current focus is to increase the HPV vaccination rate among adolescent girls 11-12 years old or before they enter the sixth grade. The vaccine affords women the most benefit if it is administered prior to first sexual intercourse. HPV is a transient virus and women may still realize some protective benefit of the vaccine even after engaging in sexual intercourse.

Purpose

The purpose of this analysis was to report HPV vaccination rates and barriers to vaccination among a racially diverse population of college women between the ages of 18-26. A large data set was obtained from the American College Health Association’s National College Assessment (ACHA-NCHA) from the following college semesters, fall 2008, spring and fall 2009, and fall 2010. The large sample size (N=68,193) allowed the researcher to examine demographic variables (race, age, geographic location) and the effects those variables had on HPV vaccination rates. Additionally, health behaviors (e.g. gynecological exam, past Hepatitis
B and influenza vaccination, receiving STD information, and number of sexual partners) were also analyzed for the influence they had on HPV vaccination rates.

**Findings**

In this analysis, 49% of all women received the HPV vaccine. It was determined that White/non-Hispanic women had the highest HPV vaccination rate (51%). American Indian/Alaskan Native/Native Hawaiian and Hispanic/Latino women had HPV vaccination rates of 47% and 46%, respectively. Black/non-Hispanic and Asian/Pacific Islander women had the lowest HPV vaccination rates (44% and 40%, respectively). Further analysis demonstrated that minority women in this data set had a lower likelihood of receiving the HPV vaccine when compare to White/non-Hispanic women. White/non-Hispanic women also had the highest rate of receiving a gynecological exam in the past 12 months when compared to minority women. Age was also predictive of HPV vaccine status. As age increased, the likelihood of receiving the HPV vaccine decreased.

Women who engaged in the following health behaviors were more likely to receive the HPV vaccine; received a gynecological exam in the past 12 months, received the Hepatitis B and influenza vaccine, and had a source of health insurance. Women who received a gynecological exam in the past 12 months were almost twice as likely to receive the HPV vaccine as those who did not. Respondents who were covered by their parents’ insurance were also twice as likely to receive the vaccine. There was a slight increase in the likelihood that women received the HPV vaccine when they received STD information. An increase in the number of sexual partners was also shown to increase the likelihood of receiving the HPV vaccine.
Conclusion

The HPV vaccine has the potential to further decrease the development of cervical cancer. The CDC recommends that women up to the age of 26 receive the HPV vaccine. Women ages 18-26 years may not have been exposed to the HPV vaccine recommendation as adolescents; therefore, they may suffer disproportionately from cervical cancer in the future. This analysis offers insight into some of the barriers college women may face in obtaining the HPV vaccine. Race was a barrier to HPV vaccination in this analysis. Additionally, lack of certain health behaviors (i.e. gynecological exam in the past 12 months and lacking a source of health insurance) influenced HPV vaccination rates. Decreasing disparities in health care is often a focus of public health. Acknowledging that minority women have lower HPV vaccination rates and drawing attention to potential barriers, allows health policy makers to formulate plans regarding future health promotion activities.

Adolescent girls are the primary focus when trying to increase HPV vaccination rates. Nonetheless, women over the age of 18 may still benefit from decreased cervical cancer rates provided by HPV vaccination. This analysis did not explore perceived risks, perceived benefits, perceived severity or the HPV knowledge level of the respondents, which can influence a woman’s choice to receive the vaccination.

Recommendations

1. Health promotion activities should be targeted to specific populations in an effort to increase HPV vaccination rates.

2. Promote general preventative health behaviors such as yearly gynecological exams.

3. Encourage research regarding HPV vaccination recommendation patterns by physicians.
4. Promotion of the HPV vaccine while women are seeking another form of preventative health care could provide a window of opportunity to educate women about the vaccine and potentially increase vaccination rates. (E.g. provide women with HPV vaccine information at flu vaccine drives).

Timmerie Cohen