1-9-2015

Human Papillomavirus (HPV) Vaccination Coverage Estimates Among Adolescent Females within the Delta Regional Authority Using National Immunization Survey Teen (NIS-Teen) 2008 - 2012.

David Yankey

Follow this and additional works at: http://scholarworks.gsu.edu/iph_theses

HUMAN PAPILLOMAVIRUS (HPV) VACCINATION COVERAGE ESTIMATES AMONG ADOLESCENT FEMALES WITHIN THE DELTA REGIONAL AUTHORITY USING NATIONAL IMMUNIZATION SURVEY TEEN (NIS-TEEN) 2008 - 2012.

By

DAVID YANKEY, MS

A Thesis Submitted to
The Graduate Faculty of Georgia State University
In Partial Fulfillment of the Requirements for the Degree

MASTER OF PUBLIC HEALTH

Under the Direction of

Ruiyan Luo, PhD, Laurie D. Elam-Evans, PhD, MPH, Connie L. Bish, PhD, MPH

ATLANTA, GEORGIA
30303

HUMAN PAPILLOMAVIRUS (HPV) VACCINATION COVERAGE ESTIMATES AMONG ADOLESCENT FEMALES WITHIN THE DELTA REGIONAL AUTHORITY USING NATIONAL IMMUNIZATION SURVEY TEEN (NIS-TEEN) 2008 - 2012.

By
David Yankey, MS

Approved by:

Ruiyan Luo, PhD
Committee Chair

Laurie D. Elam-Evans, PhD, MPH
Committee Member

Connie L. Bish, PhD, MPH
Committee Member

September 26, 2014

Author's Statement

In presenting this thesis as a partial fulfillment of the requirements for an advanced degree from Georgia State University, I agree that the Library of the University shall make it available for inspection and circulation in accordance with its regulations governing materials of this type. I agree that permission to quote from, to copy from, or to publish this thesis may be granted by the author or, in his absence, by the professor under whose direction it was written, or in his absence, by the Associate Dean, College of Health and Human Sciences. Such quoting, copying, or publishing must be solely for scholarly purposes and will not involve any potential financial gain. It is understood that any copying from or publication of this thesis which involves potential financial gain will not be allowed without written permission of the author.

David Yankey
Signed by Author

Notice to Borrowers

All thesis deposited in the Georgia State University Library must be used in accordance with the stipulations described by the author in the preceding statement.

The Author of this Thesis is:

DAVID YANKEY, MS
2667 Holmes Mills Place SW
Marietta, GA 30064

The Chair of the committee for this Thesis is:

Ruiyan Luo, PhD
School of Public Health
One Park Place
Atlanta, GA 30303

Users of this thesis who are not regularly enrolled as student at Georgia State University are required to attest acceptance of the preceding stipulation by signing below. Libraries borrowing this thesis for the use of their patrons are required to see that each user records here the information requested.

NAME OF USER	ADDRESS	DATE	TYPE OF USE (EXAMINATION ONLY FOR COPYING)

CURRICULUM VITAE (ABBREVIATED)
DAVID YANKEY
SEPTEMBER, 2014

Address: 2667 Holmes Mill Place SW
              Marietta, Georgia 300064-4209
Phone: (770) 919-2027
Email: daveyankey@yahoo.com   dyankey@student.gsu.edu

Education
In Progress   MPH, School of Public Health, Georgia State University
2006   Graduate Certificate in Public Health, Institute of Public Health, Georgia State
              University
2004   MS, Mathematics & Statistics, Georgia State University
1998   BSc., Mathematics & Statistics, University of Cape Coast, Cape Coast, GHANA

Professional Experience
2010-Present Job Title: Mathematical Statistician
Employer: Assessment Branch / Immunization Services Division
              NCIRD/Centers for Disease Control and Prevention, Atlanta, Georgia 30333

2008-2010   Job Title: Statistician
Employer: Logistics Health Incorporated (Contractor)
              Assessment Branch/ Immunization Services Division
              NCIRD/Centers for Disease Control and Prevention, Atlanta, Georgia 30333

2005-2008   Job Title: Labor Market Specialist II
Employer: Georgia Department of Labor
              Workforce Information and Analysis Division
              223 Courtland Street, Atlanta, Georgia 30303

2004 – 2008   Job Title: Visiting Instructor
Employer: Georgia State University
              Department of Mathematics and Statistics
              750 Pryor Street, Atlanta, Georgia 30303

Selected Publications
♦ L D Elam-Evans, **D Yankey**, J Singleton, M Kolasa, "National, State, and Selected Local
   Area Vaccination Coverage Among Children Aged 19-35 Months – United States, 2013".
   MMWR 2014 August, 29; 63(34);741-748. Available at
   http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6334a1.htm?s_cid=mm6334a1_e
♦ S Stokley, J Jeyarajah, **D Yankey,** M Cano, J Gee, J Roark, C Robinette Curtis, L
   Markowitz. "Human Papillomavirus Vaccination Coverage Among Adolescents, 2007-
   2013, and Postlicensure Vaccine Safety Monitoring, 2006-2014 — United States".
   MMWR 2014 July, 25; 63(29);620-624. Available at
   http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6329a3.htm?s_cid=mm6329a3_e

References:

Ruiyan Luo, PhD
Professor, School of Public Health, Georgia State University
One Park Place
Suite 640
Atlanta, Georgia 30303
Phone: 404-413-1435
Email: rluo@gsu.edu

Laurie D. Elam-Evans, PhD, MPH
Lead Health Scientist, Assessment Branch, Immunization Services Division
National Center for Immunization and Respiratory Diseases
Centers for Disease Control and Prevention
1600 Clifton Road, NE, Mailstop A-19
Atlanta, Georgia 30333
Phone: 404-718-4838
Email: lxe1@cdc.gov

Connie L. Bish, PhD, MPH
Team Lead, Applied Research and Translation Branch, Division of Population Health
National Center for Chronic Disease Prevention & Health Promotion
Centers for Disease Control and Prevention
4770 Buford Hwy, Mailstop F-78
Atlanta, Georgia 30341
Phone: 770-488-5542
Email: aez2@cdc.gov

James A. Singleton, PhD
Branch Chief, Assessment Branch, Immunization Services Division
National Center for Immunization and Respiratory Diseases
Centers for Disease Control and Prevention
1600 Clifton Road, NE, Mailstop A-19
Atlanta, Georgia 30333
Phone: 404-639-8560
Email: xzs8@cdc.gov

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

INTRODUCTION: Since 2006, the Advisory Committee for Immunization Practices (ACIP) has recommended routine vaccination of adolescent girls at ages 11 or 12 years with 3 doses of human papillomavirus (HPV) vaccine to prevent cervical cancer. Cervical cancer disparities exist for several populations in the United States. The topic is scantly documented in scholarly literature with modest knowledge of the uptake of the HPV vaccine in the Delta region.

AIM: To examine the HPV vaccination coverage estimates in the counties and parishes that comprise the Delta Regional Authority (DRA) and compare with other non-DRA counties or parishes and the rest of US. This will provide vaccination coverage estimates for adolescent females in the DRA designated Delta region that will provide public health professionals with data for policy and programmatic decision-making.

METHODS: We combined data from multiple survey years (2008-2012) from the National Immunization Survey-Teen (NIS-Teen). We conducted bivariate analyses to describe the distribution across selected socio-demographic characteristics and multivariable logistic regression models to produce adjusted prevalence ratios.

RESULTS: Teens in the DRA had lower HPV vaccine initiation and completion rates compared to Non- DRA counties or parishes and the Rest of the US. The 3-dose HPV vaccination series completion rate among those who had initiated HPV vaccination and had 24 weeks between their first dose and the NIS interview date was 60.9% (95% CI: 55.8 – 65.8) among adolescent females in the DRA compared to 66.9 (95% CI: 63.7-70.0) of adolescent females in the Non-DRA counties and 67.6% (95% CI: 66.2-69.0) in the rest of the US.

CONCLUSION: The low HPV vaccination coverage among adolescents in the DRA showed that it is important to implement additional strategies to increase HPV vaccination coverage that

will prevent cancers associated with HPV in the DELTA Region. Stronger provider

recommendations and awareness are important for increasing HPV vaccine uptake.

CHAPTER I

INTRODUCTION

1.1 Background

Since 2006, the Advisory Committee for Immunization Practices (ACIP) has recommended routine vaccination of adolescent girls at ages 11 or 12 years with 3 doses of human papillomavirus (HPV) vaccine to prevent cervical cancer (CDC, 2007, 2013). Nationwide vaccination coverage with ≥1 dose of HPV vaccine increased from 25.1% in 2007 to 53.0% in 2011; however, coverage in 2012 (53.8%) was similar to 2011 estimates.

Cervical cancer disparities exist for several populations in the U.S., including females from the Delta region as designated by the Delta Regional Authority (DRA). The Delta region, made up of 252 counties and parishes in eight states (Alabama, Arkansas, Illinois, Kentucky, Louisiana, Mississippi, Missouri, and Tennessee), is one of the most historic, culturally saturated geographic settings of the country. Yet, daily life remains a struggle for many; compared with national rates, premature deaths in the Delta region from cancer are 12% higher. The DRA strives to create jobs, build communities, and improve the lives of the nearly 10 million people in the Delta region. The DRA believes that health is an economic mechanism that has the capacity to drive future economic growth (DRA, 2013). HPV vaccination offers an impetus for reducing cancer-related disparities.

1.2 Purpose of Study

There is inadequate documentation and limited evidence-based knowledge of the uptake of the HPV vaccine in the Delta region. This thesis aims to provide vaccination coverage estimates for adolescent females in the DRA designated Delta region that will provide public health professionals with data for policy and programmatic decision-making.

1.3 Research Questions

Three research questions were addressed:

1. What are the HPV vaccination coverage estimates from counties and parishes that comprise the Delta Regional Authority (DRA)?

2. Are there differences in HPV vaccination coverage estimates between the DRA compared to other counties or parishes in the Delta states that are not part of the DRA?

3. Are there differences in HPV vaccination coverage estimates between the DRA compared to other Non-Delta states (Rest of U.S.)?

CHAPTER II

REVIEW OF THE LITERATURE

2.1 The Delta States

The Delta region (Delta) is located in the central and southern parts of the United States. The Delta Regional Authority (Figure 1) is made up of 252 counties and parishes in eight states: Alabama, Arkansas, Illinois, Kentucky, Louisiana, Mississippi, Missouri and Tennessee (DRA, 2013). The Delta has one of the most fertile soils in the world, with established irrigation technology to complement its untapped agricultural resources. Additionally, the Delta boasts of rich cultural history that sets a respectable standard with its peers. During the 1800s, cotton was a main cash crop throughout the Delta (especially Arkansas and Mississippi) and African-American slaves worked on the farms. Before the Civil War, the largest percentage of slaves lived in the Delta and made up the majority of the Delta population. In spite of its rich agricultural resources, the Delta region faced unfavorable race relations, severe poverty, and a resistance to social change that affected its economic development (Gray 1991, 238). For example, in 2000, about 17.0% of the population of Missouri and 12.5% of the population of Louisiana lived below the poverty line.

The health status of the Delta population is also poor, compared to that of the rest of the nation. For example, compared with national rates, deaths in the Delta region from cancer are 12% higher.

The Delta is overseen by the Delta Regional Authority (DRA, 2013). The DRA was established in 2000 by an Act of Congress to work towards economic development and improve living standards for residents of the Delta region. DRA has since made major improvements towards job creation, building communities, and the enhancement of the lives of almost ten

3

million people in the Delta region. The DRA considers health as one of the areas of importance

for economic growth; they refer to health as an economic engine (DRA, 2013).

Figure 1

Delta Regional Authority (DRA) Counties and Parishes in the U.S.A.
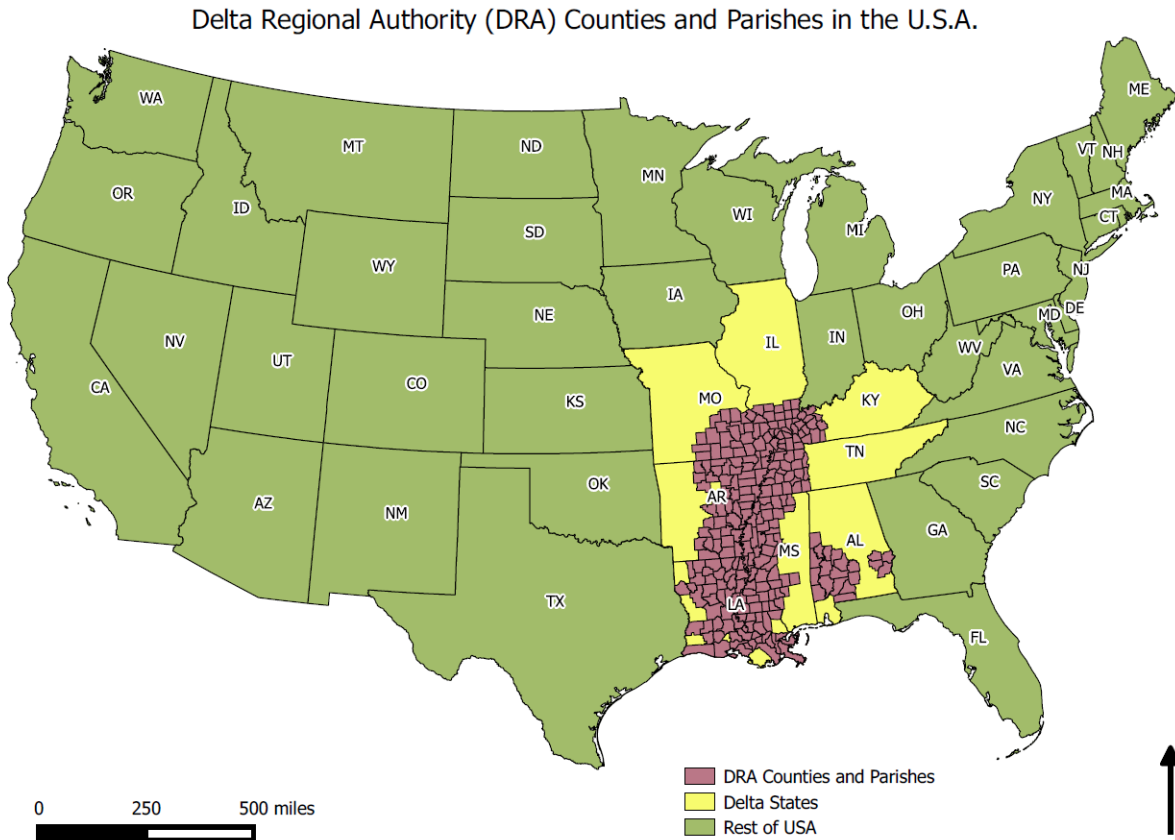
2.2 Cervical Cancer in the United States

The World Health Organization (WHO) and International Agency for Research on

Cancer (IARC) estimate that in 2012, about 8.2 million people died from cancer (GLOBOCON

2012, IARC). Cancer is the second leading cause of death in the United States. The American

Society of Clinical Oncology (ASCO) projects that cancer could be leading cause of death in

United States by 2030. Cervical cancer was the primary cause of cancer death among women in

the United States. Early screening methods, such as Papanicolaou test (PAP tests) have served

as an intervention to find precancerous cells earlier. This intervention has helped to reduce cervical cancer deaths, and they are no longer listed among the three most common cancers among females.

Since 2006, the Advisory Committee for Immunization Practices (ACIP) has recommended routine vaccination of adolescent girls at ages 11 or 12 years with 3 doses of human papillomavirus (HPV) vaccine to prevent cervical cancer (CDC, 2007, 2013). Although nationwide vaccination coverage with ≥1 dose of HPV vaccine increased from 25.1% in 2007 to 53.0% in 2011, coverage in 2012 (53.8%) was similar to 2011 rates.

Even though there has been reduction in cervical cancer in the US, disparities do exist. The Centers for Disease Control and Prevention estimates that in 2010, incidence rates of cervical cancer were highest among black women, followed by Hispanic, White, American Indian/Alaska native and Asians/Pacific Islander women in that order (CDC, 2013). Cervical cancer disparities exist for several populations and geographic areas in the United States. As of 2010, most of the southern states in the US exhibited the highest cervical cancer incidence rates of between 8.1 – 11.2 per 100,000 (data were not available on cervical cancer rates for Arkansas) (CDC, 2014). Furthermore, disparities exist among females from the Delta states as designated by the Delta Regional Authority (DRA) and even possibly among females from the Delta region.

2.3 HPV Vaccination in the United States

Human Papillomavirus vaccination (HPV) offers a strategy for reducing these disparities. Vaccines against the (HPV) help to prevent cervical cancer and other HPV related infections. HPV vaccines have played a major role in reducing cervical cancer incidence. Different countries may have different target ages for routine and catch up vaccinations against HPV

(Hariri, Markowitz, Dunne, & Unger, 2013). The 3-dose vaccine series is given over six months. Cervarix and Gardasil are HPV vaccines that protect against cervical cancer whereas Gardasil also has protective effects against genital warts, vulvar, vaginal and anal cancers. Gardasil is therefore recommended for vaccination among males. The CDC recommends vaccination among girls and boys at ages 11 to 12 years. Preteen vaccination is an important protection measure before they are exposed to the infection. Teenage girls and women up to age 26 years and males up to age 21 years who missed the vaccination in preteen years are recommended to have the vaccination.

The annual report to the nation on status of cancer for 1975 – 2009 showed that about 32.0% of girls aged 13 to 17 years in US completed the 3-dose regimen for HPV vaccination in 2010, with lower coverage of about 14.1% among those who had no health insurance. The southern states showed lower HPV vaccination coverage than that of the rest of the US. Alabama and Mississippi, for example, recorded rates around 20% (Jemal et al., 2013).

2.4 Determinants of HPV Vaccination in the United States

Many factors are associated with HPV vaccination uptake in the United Sates. These factors are related to the target group; parents, and providers. Some strong indicators of HPV uptake are provider recommendation, healthcare education and availability of trained health care providers. Most adolescents are willing to be vaccinated based on provider recommendation, and parents are more supportive of vaccinating their children when providers recommend HPV vaccination. (Ylitalo, Lee, & Mehta, 2013)

Even though recommendations are important for high vaccine uptake, there are factors that make it difficult for health care providers to recommend HPV vaccination to their patients.

Bynum, Staras, Malo, Giuliano, Shenkman, and Vadaparampil (2014) found that generally, it feels uneasy to discuss sexually transmitted infections with teenagers especially with target adolescents. Other important factors like specialty in the area of sexually transmitted infections, infrastructure and an administration that supports recommendation of vaccines against sexually transmitted infections are vital in improving HPV vaccination coverage.

Some healthcare workers in other specialty areas may feel that it is not necessarily their focus; however it is important that every health care worker takes each opportunity to educate and recommend the uptake of vaccines against sexually transmitted infections especially if the vaccines are available (Daley, Vamos, Buhi, Kolar, McDermott, & Hernandez, et al. 2010). Healthcare workers should be trained to overcome impediments to recommendation since recommendation are major instruments for influencing sexual behaviors and risk education. Bynum et al. (2014) also point out certain challenges such as difficulty in ensuring vaccine series completion that needs to be addressed.

For males, health care provider recommendations may be a very important factor that may be lacking. Vadaparamil and colleagues (2013) report from their studies on HPV recommendations that some physicians reported that they do not recommend HPV vaccine to males. Many reasons may account for this, including, but not limited to the physicians not being aware of new policies, or that they still feel it is the responsibility of other reproductive health providers. The Physicians in the study indicated the need for more information on HPV vaccination, and knowledge about the safety and efficacy for males (Vadaparampil, Murphy, Rodriguez, Malo, & Quinn, 2013).

Difficulty in completing the vaccine schedule could be due to vaccine availability, proximity to health care service areas, time constraints, and inability to pay for vaccines if they

are not free or in the absence of insurance are many characteristics that can influence change. These factors are more patient dependent than provider dependent.

Access to health care is correlated with race and ethnicity (Gelman, Miller, Schwarz, Akers, Jeong & Borrero, 2013). Gelman, et al. (2013) studied the association between race/ethnicity and HPV vaccine initiation and to determine the role of access to health care. They assessed 2,168 females aged 15-24 years from nationally representative data from the National Survey of Family Growth. They concluded that the observed lower rates of HPV vaccination among African-American females were not explained by difference in access to health care. Further research can explain this relationship as access may affect the interplay between vaccine completion and vaccine initiation.

A study that assessed mothers' support for school based HPV vaccination found that about 67% of mothers who had the intention of vaccination for their daughters were willing to allow their daughters to receive the vaccine at school (Kadis, McRee, Gottlieb, Lee, Reiter, & Dittus, et al. 2011). Some mothers (about 40%) expressed their wish to be present during vaccination, whereas others (about 64%) expressed the need for their daughters' doctors to keep track of their immunizations if they had to take it at school (Kadis, et al. 2011).

Among patients and parents, there are some misconceptions on vaccination, including vaccine efficacy concerns as well as the fear that HPV vaccination will induce promiscuity among vaccinated teens, since they feel protected against HPV after vaccination. Bynum, et al. (2014) stress that sexuality communication and family medicine specialty need important consideration to help improve HPV vaccination rates.

Awareness of HPV vaccination plays an important role, and can help with initiation. It is a challenge faced by many populations irrespective of age, race or ethnicity. Community

education on HPV vaccination is a very important tool for increasing vaccine uptake. Those who had the perception that vaccinating against HPV would provide physical and psychological benefits expressed intent to vaccinate, whereas those who perceived HPV vaccination as a financial burden expressed otherwise (Wheldon, Daley, Buhi, Nyitray, & Giuliano, 2011)

Guidelines are important for identifying target groups and vaccination schedules as well as screening in the prevention of any disease including cervical cancer. Some practitioners may have challenges using guidelines, or may not adhere to treatment and prevention guidelines. Three hundred and sixty six obstetrician-gynecologists who were members of the American Congress of Obstetricians and Gynecologists (ACOG) were asked about factors and challenges that affect HPV vaccination. Almost all of them (92%) said they offered HPV vaccination to their patients. They said the refusal of parents and patients to take vaccinations were the main barriers to HPV vaccination. The study found that group practitioners were more likely than solo practitioners to adhere to HPV vaccination and screening guidelines. The conclusion was that it is important to promote guideline adherence to help with the quality of cervical cancer prevention services, since only 27% of practitioners estimated that vaccination was given to the most eligible patients (Perkins, Anderson, Gorin, & Schulkin, 2013).

2.5 Disparities in Vaccination

Although the CDC reports increases in adolescent vaccination coverage from 2006 to 2011, there are differences in the rate increases based on vaccine type. The Healthy People 2020 target for ≥3 HPV vaccine doses among females is 80.0%. In 2011, coverage with ≥3 HPV vaccine doses among females was as low as 30.0%. States in the south showed significantly lower vaccination rates for ≥1 and ≥3 doses of HPV, compared to Northeast and Western states.

Coverage with ≥1 dose of HPV ranged from 31.9% (Mississippi) to 76.1% (Rhode Island), and coverage for ≥3 doses of HPV, from 15.5% (Arkansas) to 56.8% (Rhode Island).

Stokley, et al. (2013) state that HPV vaccination coverage for ≥1 dose in 2012 (53.8%) was similar to that of 53.0% in 2011 even though there was a slight increase in the coverage. The researchers noted that HPV vaccination coverage for ≥1 HPV dose may have been as high as 92.6% if the HPV vaccine had been administered during health-care visits when other vaccines were administered.

Berry-Cabán & Buenaventura (2009) studied vaccine compliance among 6,154 girls aged 9 to 17 years who were enrolled in Womack Army Medical Center (WAMC) in November 2006 using the Composite Health Care System (CHCS) database. They found that only 25.7% of girls aged 9 to 17 years completed the entire 3-dose HPV series; 34.6% received 2 doses, and 39.7% received 1 dose (P-value = 0.006). Even though they do state that factors like use of the Gardasil vaccination series and time to complete the series during data collection may have affected the results, the finding that about 77% of girls aged 12 to 17 years have not yet been vaccinated is a concern for HPV prevention.

While some socioeconomic and demographic factors indicated disparities in vaccine uptake, they may not be associated with vaccination initiation (Kester, Zimet, Fortenberry, Kahn, & Shew, 2013). Research shows that low income and minority adolescents are equally likely to start the vaccination compared to their counterparts of high income or majority status, but they are less likely than Whites/majority and high income adolescents to complete the 3 dose regimen (Jeudin, Liveright, Carmen, & Perkins, 2014). Kester, et al. (2013) described some racial disparities; Blacks and Hispanics are less likely to complete vaccination. Some reasons for not

vaccinating include: concerns about vaccine safety, concerns about the implications/danger to adolescent daughter, and provider non-recommendation.

Fisher, Trotter, Audrey, MacDonald-Wallis, and Hickman (2013) conducted a meta-analysis using a random-effects model and reviewed disparities in HPV vaccine uptake among young women from its inception to March 2012. Results from analyzing 27 studies with the majority of studies conducted in the US showed differences in HPV vaccination initiation by ethnicity and healthcare coverage. They also cited low family income and education as reasons for the observed disparities.

A study assessed HPV vaccination status among 2,205 households with girls aged 9-17 years in the 2008 National Health Interview Survey. This study found that disparities in HPV vaccine uptake among the age groups: 2.8% (9 to 10 yrs.), 14.7% (11 to 12 yrs.), and 25.4% (13 to 17 yrs.) had at least 1 dose of HPV vaccine whereas fewer received all 3 doses: 5.5% (11 to 12 yrs.) and 10.7% (13 to 17 yrs.). The main reasons stated for non-vaccination were that the parents believed the vaccine was not necessary for their daughters (Wong, Berkowitz, Dorell, Price, Lee, & Saraiya, 2011).

METHODS AND PROCEDURES

3.1 Overview

The National Immunization Survey-Teen (NIS-Teen) is a random-digit-dialing telephone survey of parents/guardians of adolescents aged 13-17 years. NIS-Teen also includes a mailed survey to all vaccination providers identified by the parent and for which consent was granted to contact for vaccination history (Jain, Singleton, Montgomery, & Skalland, 2009). The NIS-Teen uses a national probability sample of households in the United States, which includes all 50 states, the District of Columbia, and some select local areas. It is conducted using the sampling frame of telephone numbers selected for the core NIS, which measures vaccination coverage in children 19-35 months.

We analyzed NIS-Teen data from 2008 to 2012. The data for 2008 to 2010 included landline only households while the data for 2011 and 2012 were conducted using landline and cellular telephone households (CDC, 2011, 2012). Provider confirmed vaccination records were used to determine all HPV vaccination coverage estimates among females in this study. Adolescent females without adequate provider data were excluded from the analysis. Details of the NIS-Teen methodology, including how vaccination data are combined to produce a synthesized immunization history and weighting procedures, have previously been published (CDC, 2011, 2012). NIS-Teen was approved by the CDC Institutional Review Board (IRB).

3.2 Study population and setting

Our study population was grouped into three geographic categories. The first category and focus of our analysis is the Delta Regional Authority (DRA). The DRA includes 252

counties and parishes in parts of Alabama, Arkansas, Illinois, Kentucky, Louisiana, Mississippi, Missouri and Tennessee (DRA, 2013). The second category includes counties within the Delta States that are not considered as part of DRA (Non-DRA counties). The third category includes the remaining U.S. states (rest of USA). HPV vaccination coverage estimates of adolescent females from DRA were compared to estimates in the other two geographic categories. In this study, we include a total of 47, 709 adolescent females aged 13-17 years who participated in the NIS-Teen during the period of 2008 to 2012 and had adequate provider data.

3.3 Variables and definitions

The outcome for this analysis is HPV vaccination coverage. We examined four dichotomous (yes or no) HPV vaccination coverage measures: (1) initiation: receipt of at least one HPV dose; (2) receipt of at least two HPV doses; (3) receipt of at least three HPV doses; and (4) completion: receipt of three HPV doses among initiators who had more than 24 weeks between the first HPV dose and the interview date. We examined the following socio-demographic characteristics of the sample population, Year of interview (2008, 2009, 2010, 2011, and 2012), Age of Teen in years (13, 14, 15, 16, and 17), Race/Ethnicity (White, non-Hispanic; Black, non-Hispanic; Hispanic; and Other), Mother's Education (<High School; High School Graduate; >High School, Some College; and College Graduate), Mother's Marital Status (Married; Divorce/Widowed/Separated; and Never Married), Mother's Age in years (≤34 years; 35-44 years; and ≥45 years), Teen had a preventive care visit at age 11 or 12 years (Yes; and No), Income to poverty ratio (<133%; 133% - < 322%; 322% - <503%; and >503%), Vaccination payment source (Private Only; Medicaid / CHIP; Uninsured; Military; and Other), Received provider recommendation for HPV vaccination (Yes; and No), Knowledge about HPV

Vaccine (Yes; and No), Heard about HPV vaccine (Yes; and No), Number of Total Providers (1; 2 – 3; and 4 or more), Facility Type (Private; Public; Hospital; Mixed; and Other), and Metropolitan Statistical Areas (MSA) (Urban; Suburban; and Rural Area). Among parents whose daughters were unvaccinated and had not received all three doses of HPV, we examined intent to vaccinate their daughters in the next year. These parents were asked, "How likely is it that [TEEN] will receive HPV shots in the next 12 months?" Response options included "very likely," "somewhat likely," "not too likely," "not likely at all," and "not sure/don't know." Parents with responses other than "very likely" were asked, "What is the main reason [TEEN] will not receive HPV shots in the next 12 months?" This open-ended survey item allowed parents to indicate multiple reasons. We categorized these responses as (Already Sexually Active, Already Up-To-Date, Child Fearful, Child Should Make Decision, College Shot, Costs, Don't Believe in Immunizations, Family / Parental Decision, Handicapped / Special Needs / Illness, Increased Sexual Activity Concern, Lack of Knowledge, More Info / New Vaccine, No Doctor or Doctor's Visit Not Scheduled, No Ob/Gyn, Not A School Requirement, Not Appropriate Age, Not Available, Not Recommended, Not Sexually Active, Other Reason, Religion / Orthodox, Safety Concern / Side Effects, Time, Effectiveness Concern, and Not Needed or Not Necessary).

3.4 Analytic Approach

We combined data from multiple survey years (2008-2012) using recommended methods (CDC, 2012). Point estimates and their 95% confidence intervals (CIs) were weighted to be representative of the states from which they were actually sampled. Bivariate analyses were used to describe the distribution across selected sociodemographic characteristics in each of the

three geographic categories. T-tests were used to identify statistically significant differences. We

considered differences with p-values of <0.05 as statistically significant. We also conducted a

multivariable logistic regression model to produce adjusted prevalence ratios (APR) and 95%

CIs. Statistical analysis was conducted using SAS callable SUDAAN release 11.0 (Research

Triangle Institute, Research Triangle Park, NC) to account for the complex sampling design of

the NIS-Teen data. All reported frequencies are unweighted.

CHAPTER IV

RESULTS

4.1 Demographic characteristics:

In the DRA, adolescent females aged 13-17 years in NIS-Teen from 2008-2012 totaled 1,903 compared to 4,997 in the Non-DRA counties and 40,809 in the rest of US (Table 1). Over half (53%) in the DRA compared to 66% in the Non-DRA counties and 57% in the rest of US were Non-Hispanic whites, 41% compared to 18% in the Non-DRA counties and 14% in the rest of US were Non-Hispanic blacks and 3.5% compared to almost 11% in the Non-DRA counties and 21% in the rest of US were Hispanics.

More than half of the mothers (53.8%) in the DRA compared to 60.2% in the Non-DRA counties and 60.4% in the rest of US had more than high school education and nearly 58% compared to 69.2% in the Non-DRA counties and 71.1% in the rest of USA were married. Most of the mothers in the DRA were 35 years of age or older (about 83%) compared to 88.6% in the Non-DRA counties and 91% in the rest of US.

About 83% of the teens in the DRA had a preventive care visit at 11 or 12 years of age compared to 87.6% in the Non-DRA counties and 87.6% in the rest of US. Forty percent of the DRA households had income to poverty ratio (IPR) below 133% compared to about 29% in the Non-DRA and 28.8% in the rest of US; 32% of the DRA households had their IPR between 133% and 322% compared to about 33% in the Non-DRA counties and 30.3% in the rest of US.

In terms of vaccination payment sources, about 45% of the DRA households reported using Medicaid or Chip compared to 34% in the Non-DRA counties and 31.1% in the rest of US while 44% in the DRA used private providers as compared to 56% in the Non-DRA counties and

56% in the rest of US. Six percent of the DRA were uninsured compared to 4% in the Non-DRA counties and 6.6% in the rest of US.

Only 45% of the DRA parents reported receiving provider recommendation for HPV vaccination as compared to about 55% in the Non-DRA counties and about 58% in the rest of US. About 88% of the DRA households reported knowing about the HPV vaccine compared to 91% in the Non-DRA counties and about 91% in the rest of US. Approximately 79% of DRA households said they had heard about HPV compared to about 84% in the Non-DRA counties and about 85% in the rest of US. Forty-six percent of the DRA households reported having one provider compared to 51% in the Non-DRA counties and 54% in the rest of US but 37% of the DRA reported 2-3 vaccine providers compared to 32% in the Non-DRA counties and 30% in the rest of US.

Sixty-one percent of the DRA reported having 2 or more contacts with a physician in the last year compared to 60% in the Non-DRA counties and 57% in the rest of US. About 34% of the DRA households reported receipt of HPV vaccine at a private facility compared to 47% in the Non-DRA counties and about 57% in the rest of US, while 38% of the DRA received HPV vaccine at public facility compared to 23% in the Non-DRA counties and 16% in the rest of US. About 47% of the DRA sample lived in a rural area compared to 21% in the Non-DRA counties and 14% in the rest of US.

4.2 HPV Initiation:

About 41% (95%CI: 38.0-43.9) of adolescent females in the DRA had initiated HPV vaccination (Table 2). Initiation increased from 25.3% in 2008 to 49.7% in 2012 with the only significant increase in coverage occurring the first year after the ACIP recommendation. In

2008, participants in DRA were 30% less likely to have HPV initiation than participants in 2012. For Non-DRA counties, they were 24% less likely in 2008 and 19% less likely in 2009 compared to 2012 to have HPV initiation. Trends were similar to Non-DRA counties for the rest of the US (Table 2).

Significant disparities for HPV initiation were not identified for DRA counties compared to Non-DRA counties. However, for Non-DRA counties, we found that those who were aged 13 and 14 are about 20% less likely than 17 years olds to initiate HPV vaccination, for the rest of US, these differences are demonstrated for ages 13, 14 and 15 (Table 2). Initiation of HPV vaccination did not vary by race among DRA and Non-DRA counties; however, for the rest of the US, Hispanics are 20% and people of other races are 11% more likely than Non-Hispanic Whites to initiate HPV vaccination.

In the DRA, mothers with some college education are less likely than mothers with less than high school education to initiate HPV vaccination. For the rest of the US, mothers with at least a high school education or greater were 20% less likely to initiate the HPV vaccination (Table 2). Mothers' age is a relevant factor for HPV initiation for the rest of the US; those whose mothers were aged 35 years or older were 10% less likely to initiate. Teens in the DRA and rest of the US who did not have a preventive care visit at age 11or 12 years were less likely than those who had a preventive care visit to initiate HPV vaccination.

In the Non-DRA counties, households with income to poverty ratio (IPR) between 322% and 503% were 14% less likely than those with IPR of 503% to initiate the HPV vaccination, while in the rest of the US, those between 133% and 322% were 14% and those between 322% and 503% were 6% less likely to initiate the HPV vaccination compared to this reference group. Adolescent females who used Medicaid or CHIP as their vaccination payment source were 37%

more likely to initiate HPV vaccination compared to those with a private provider in the DRA counties while in the rest of the US, they were 16% more likely to initiate HPV vaccination. Uninsured adolescent females in the rest of US were 11% less likely to do so. For those who did not receive a provider recommendation for vaccination, they were all less likely to initiate HPV vaccination across all three geographic subgroups compared to those who did receive a provider recommendation (Table 2).

Adolescent females with two or more total providers were less likely to initiate HPV vaccination in the rest of the US compared to those who had only one provider. Association with number of physician contacts within the past year showed significance for some Non-DRA counties and in the Rest of the US (Table 2). For facility type, in the DRA counties, adolescents who use public facility were 26% less likely than those who use private services to initiate HPV vaccination. A similar pattern is seen for Non-DRA counties and the rest of the US among this group however, in the rest of the US, those who use mixed facilities are 7% more likely than those who use private services alone to initiate HPV vaccination. Whereas there are no significant differences observed among people in urban and suburban areas compared to rural areas in the DRA and Non-DRA counties, for the rest of the US, they are all about 6-7% more likely than those in the rural areas to initiate HPV vaccination.

4.3 Two or more HPV doses:

The data indicate about 32% (95%CI: 28.8-34.4) of adolescent females in the DRA had received two or more doses of the HPV vaccination (Table 3). Although 2+ HPV vaccination coverage was significantly higher in 2011 [40.0% (95% CI: 33.4-46.9)] than in 2008 [18.3% (95% CI: 13.7-24.1)] we found a decrease in coverage from 2011 to 2012 [37.3% (30.6 -44.6)].

Results from the multivariable analyses in Table 3 reveal that coverage estimates for 2+ HPV vaccination doses is not different from that for HPV initiation for the population subgroups, with exception of adolescent females who are 15 years of age and those whose mothers are 35-44 years of age. The 15 year old adolescents had an APR of 1.26 (95% CI: 1.00-1.58; p-value 0.04) which is significantly higher 2+ HPV dose vaccination coverage than the referent group. On the other hand, adolescent females with mothers 35-44 years of age had an APR of 0.71 (95% CI: 0.55-0.90; p-value 0.01) which is significantly lower 2+ HPV dose vaccination coverage compared to the referent group (mothers ≤34 years of age).

Race and ethnicity, mother's education, mother's marital status, number of total providers, number of physician contacts within the past year and MSA are not associated with 2+ HPV dose vaccination coverage in the DRA counties (Table 3). Provider recommendation is still a very important determinant of 2+ HPV dose vaccinations; those who did not receive any provider recommendation are 55% less likely than those who did to have 2+ HPV dose vaccination. However, people who use public facility are 32% less likely than people who use private services in the DRA to have 2+ HPV dose vaccinations.

The data indicates about 31.7% (95% CI: 30.0-33.6) of adolescent females in the Non-DRA counties had received two or more doses of the HPV vaccination (Table 3). Although 2+ HPV vaccination coverage was significantly higher in 2011 (i.e. 39.8% (95% CI: 35.5-44.3)) than in 2008 (i.e. 21.5% (95% CI: 18.1-25.2)), the data have not demonstrated significant annual increases. Results from the multivariable analyses in Table 3 reveal that coverage estimates for 2+ HPV vaccination doses is not that different from that for HPV initiation for the population subgroups, with exception of adolescent females who used Medicaid or CHIP as their vaccination payment source, with an APR of 1.20 (95% CI: 1.02-1.41; p-value 0.03) which was

statistically significantly higher than their referent subgroup (those who used private sources of payment).

4.4 Three or more HPV doses:

In the DRA, about 23% (95%CI: 20.1-25.0) of the adolescent females had completed all of the recommended 3 doses of the HPV vaccination (Table 4). Vaccination coverage estimates for 3+ HPV doses increased from 9.5% (95% CI: 6.8-13.2) in 2008 to 28.2% (95% CI: 22.2-35.1) in 2012. In the multivariate analysis, APR of 0.46 (95% CI: 0.30-0.69; p-value < 0.01) in 2008 showed there was a significant increase compared with the coverage estimates in year 2012 (i.e. reference level).

We also observed an increase in coverage for both Non-DRA counties and in the rest of the US. Adolescent females 14 years old with APR of 0.69 (95% CI: 0.49-0.98; p-value 0.04) were the only age group significantly less likely to be vaccinated compared to adolescent females 17 years of age in the DRA (Table 4) according to the multivariate analysis. However, for Non-DRA counties, this decrease occurred in females aged 13 and 14 years and for the rest of US, females aged 13, 14, and 15 years were significantly less likely to have received ≥ 3 doses of HPV.

Racial and ethnic differences for 3+ HPV vaccine uptakes are not demonstrated in DRA or Non-DRA counties, but blacks in the rest of the US were 12% less likely and Hispanics were 9% more likely than whites to have received 3+ HPV vaccine doses. The prevalence of adolescent females with 3+ HPV vaccine doses among those on Medicaid or CHIP (APR 1.64, 95% CI: 1.21-2.22; p-value < 0.01) as their vaccinated payment source was statistically significantly higher than those who used private sources of payment from the multivariate

analysis. Whereas vaccination payment source showed no differences in Non-DRA counties, in the rest of the US adolescent females who used Medicaid or CHIP were 15% more likely and the uninsured were 21% less likely than their counterparts who used private source as payment for vaccination to obtain 3+ vaccinations.

Across all counties in the USA, provider recommendation is still a strong determinant of obtaining 3+ HPV dose vaccination uptakes (Table 4) and the use of public facilities is associated with lower likelihood of obtaining this compared to those who use private facilities.

4.5 HPV Completion:

Generally, 60.9% (95% CI: 55.8-65.8) of adolescent females in the DRA had completed the 3-dose HPV vaccination compared to 66.9% (95% CI: 63.7-70.0) of adolescent females in the Non-DRA counties and 67.6% in the rest of the USA. In 2012, the prevalence ratio for DRA counties was significantly higher (62.7%) than it was in 2008 (43.2%); however, the rates have not demonstrated incremental improvements over time (Table 5).

We did not observe age differences in completion for females in DRA. However, for Non-DRA counties, females aged 13 years, and the rest of the US females aged 13 and 15 years were less likely to complete vaccination than females aged 17 years. Adolescent females whose family IPR was less than 133% had an APR of 0.67 (95% CI: 0.50–0.89; p-value 0.01) and were less likely to have completed the 3- dose HPV vaccination than those with IPR of >503% in the DRA.

4.6 Intent and reasons for not intending to receive HPV vaccination:

Among the teens without HPV vaccination, about 45% of their DRA parents reported a "very likely" or "somewhat likely" intent to receive the HPV vaccine compared to about 42% in the Non-DRA counties and about 40% in the rest of US. The most common reasons for not intending to vaccinate in the DRA were belief that vaccination is unnecessary (23.6%, 95%CI: 19.1-28.8), concerns about vaccine safety or side effects (18.2%, 95%CI: 14.4-22.8), indicating daughters were not sexually active (17.3%, 95%CI: 13.7-21.7), lack of knowledge about vaccine (16.6%, 95%CI: 12.7-21.3), and the vaccine not being recommended by the provider(12.1%, 95%CI: 9.1-15.8) (Table 6).

CHAPTER V

DISCUSSION AND CONCLUSION

5.1 Discussion of Research Questions:

Initiation

Looking at factors associated with initiation of the HPV vaccine in DRA counties, public

programs that provide vaccines are an important determinant for vaccine initiation. Adolescents

with Medicaid or CHIP had higher vaccine initiation rates compared to adolescents without. In a

research conducted by Keating, Brewer, Gottlieb, Liddon, Ludema, and Smith, (2008), most

medical practitioners in high risk areas listed concerns about reimbursement for vaccine services

provided, and cost to patients as well as the inconvenience of determining the insurance status of

patients as barriers to vaccination.

Additionally, individuals that use public facilities are less likely to initiate than those who

use private facilities. This scenario influenced the role of recommendation in these facilities for

vaccine uptake. We also found that adolescent females whose mothers were high school

graduates were less likely to initiate HPV vaccination compared with those whose mothers had

less than high school education. The reasons underlying this situation may be complex and we

are unable to explain it within the limits of our model.

Two or more doses of HPV vaccination

We found a decrease in vaccination rates for 2012 among DRA participants. Stokley, et

al. (2013) point out that missed opportunities could be a major factor for decrease in receipt of

one or more HPV vaccination, and that without any missed opportunities for HPV vaccination in

2012, vaccination rates could have been as high as 92.6% in US. Consequently, there could have

been an increase in coverage in the DRA counties if they also had no missed opportunities for

HPV vaccination. Brewer, Gottlieb, Reiter, Liddon, Markowitz, and Smith (2011) describe some missed opportunities in receiving HPV vaccine among adolescents in high risk areas as unrealized parent intentions and lack of doctor recommendations.

Female adolescents aged 15 years were significantly more likely to receive two or more doses of HPV than those aged 17 years. Adolescents whose mothers were aged 35-44 years at the time of report were less likely to receive two or more doses than adolescents whose mothers were younger. These complex relationships need further investigation. It may have socioeconomic factors or other reasons associated with its output.

As expected, provider recommendations were associated with increases in 2+ HPV dose vaccinations for all three geographic areas of our study. Adolescents who use public facilities also showed less likelihood of receiving two or more doses of HPV vaccination. The issue with lower coverage of HPV vaccination in public facilities in 2012 may be associated with lack of recommendation for the vaccine, follow up or reminders or financing requirements (Brewer, et al. 2011; Fisher, et al. 2013; Rosenthal, Weiss, Zimet, Ma, Good, & Vichnin, 2011).

Three or more doses of HPV vaccination

Across the three geographic areas, female adolescents aged 14 years were less likely than those aged 17 years to receive three or more doses of HPV vaccination. However, among the Non-DRA counties and the rest of US, those aged 13 years were also less likely than those aged 17 years to receive three or more doses of HPV vaccination. For the rest of the US, an increasing pattern was demonstrated in this uptake, even though we found that generally those younger than 17 years were less likely to have three or more doses of HPV vaccination, the magnitude of the point estimate increases with age (Table 4).

Indicators associated with higher likelihood of receiving three or more doses of HPV vaccination included a) having Medicaid or CHIP insurance; b) provider recommendation; and c) use of private facility. In this study, we have found these factors to be consistently associated with improved vaccine uptake.

HPV completion

In the DRA, adolescents whose family IPR was less than 133% were less likely to have completed the 3 dose HPV vaccination series than those with IPR of >503%, which could be an affordability issues.

Intent and reasons for not intending to receive HPV vaccination

Several reasons account for non-receipt of HPV vaccination. Among them, we explored the following in high-to-low ranking order in the DRA: a) belief that vaccination is unnecessary; b) concerns about vaccine safety, or side effects; c) lack of knowledge about vaccine; d) indicating daughters were not sexually active; and e) the vaccine not being recommended by the provider. These same reasons were also noted for Non-DRA counties and the rest of US, however the order was different. For example, in the Non-DRA counties, belief that adolescent daughters were not sexually active ranked second after belief that vaccination is unnecessary, followed by lack of knowledge, vaccine safety concerns and lack of recommendation.

In the rest of US, the high-low ranking was as follows: a) not being sexually active; b) lack of knowledge; c) belief that vaccination was unnecessary; d) lack of recommendation; and e) safety concerns about the vaccine. These rankings can be priority areas of concern that can be tailored to specific geographic areas in education on HPV vaccination.

The finding that across all geographic areas, belief that HPV vaccination is unnecessary shows that there is the need to educate the general public on the risks of HPV infection and benefits of HPV vaccination, especially among the youth to prevent cervical cancer and any sequelae from the infection. Dempsey and others conducted a qualitative study and examined factors stated by the mothers of adolescents for not vaccinating their female adolescents against HPV. They list the importance of educating parents and addressing their safety concerns about HPV vaccination as well as the promotion of strong physician HPV vaccine recommendation (Dempsey, Cohn, Dalton, & Ruffin, 2011).

Compared to Non-DRA counties and the rest of the US, a lower rate of provider recommendations was reported in the DRA. This is an important observation concerning the lower rates of vaccination demonstrated in the DRA; since provider recommendation is associated with higher vaccination uptake (Rosenthal et al., 2013; Ylitalo, et al. 2013), this is an area for improvement in the DRA. It is important to encourage providers to make strong recommendations for HPV vaccinations to help protect females from HPV as well as improve rates of vaccination in the DRA. As participants from the DRA were found to have more physician contacts than participants from other areas, physicians could be an important factor for helping to increase vaccination in these areas; they must be encouraged to recommend the HPV vaccination.

The observation that there is a lower knowledge rate for HPV awareness and HPV vaccine in the DRA than the other two geographic areas of study implies that education on HPV must be improved in the DRA. Healthcare personnel must be trained and encouraged to help with this aspect. The thought that more parents in the DRA expressed intent to vaccinate than Non-DRA counties and the rest of US shows a possibility of increasing HPV vaccination through

awareness and improving other programs that increase opportunities, availability and accessibility to HPV vaccination processes.

Further challenges facing the DRA include the observation that less people in the DRA reported having single providers than the other two geographic areas in our study. This may be a contributory factor to lower coverage or vaccine receipt. This is because research shows that people who have single providers are more likely to initiate vaccination but also to complete vaccination schedules. The medical histories remain with an individual health care provider and are followed up or reminded when vaccinations are due. Those who have several health care providers, however, may have their medical histories dispersed and follow-up may be difficult.

The public facility is a major center for vaccine receipt in the DRA, whereas the Non-DRA counties and rest of the US use more private institutions for their vaccination. It is important to equip the public institution with logistics to recommend and provide vaccinations. It appears that individuals use fewer private institutions because of affordability (Fisher, et al. 2013). If there could be federally qualified private institutions to help provide vaccinations, then this could also improve vaccine uptake. Dempsey and others discuss how disparities in health care utilization affect HPV vaccination and noted the lack of insurance as one of the contributing factors non-vaccination exist among comparatively older women aged 19 – 26 years old (Dempsey, et al. 2011).

The observation that most of the DRA participants live in rural areas could mean they have vaccine accessibility challenges even though for certain populations' access may not be a factor (Gelman, et al. 2013). In other circumstances, distance reduces access to vaccination sites if the rural areas are not equipped with centers to provide vaccinations. It is important to equip

healthcare centers in rural areas with HPV vaccination opportunities if this is lacking to increase access (Dorell, Yankey, Santibanez, & Markowitz, 2011).

5.2 Study Strengths and Limitations

The strength of this study can be attributed to the fact that the NIS-Teen is provider-verified vaccination data. We combined multiple years of data to increase our sample size and this also increased the power of our results. Although the NIS-Teen was previously limited to household with landline telephones only, we had in our data set two years which included cell-phone sampling frames. This was instrumental in increasing the representativeness of the data for the target population. Incomplete provider vaccination records and not having community-level or county-level factors that might influence HPV vaccination could be a limitation in our study. Nonetheless, we believe the use of our findings could help inform providers and policy makers in the DRA to find ways to increase HPV vaccination.

5.3 Conclusion and Recommendation

We found that the DRA showed lower HPV vaccine initiation and completion compared to Non-DRA counties and the rest of US. There are disparities in vaccine initiation and completion across the geographic areas of study, which probably suggests the unique socio-demographic properties of the areas. Provider recommendations and awareness are important for increasing HPV vaccine uptake. Insurance and financing programs help with HPV vaccine uptake and are encouraged for the DRA. Individuals that use private facilities were more likely to initiate and complete HPV vaccination than those who use public facilities; this relationship requires further exploratory research. The low vaccination coverage among adolescents in these

areas shows that it is important to implement additional prevention strategies to reduce cancers

associated with HPV in the Delta Region.

Table 1. Characteristics of adolescent females aged 13-17 years by age at interview, National Immunization Survey-Teen, United States, 2008 - 2012

Sociodemographic Characteristics	United States		Delta Regional Authority States (DRA)				Rest of US	
			DRA Counties		Non-DRA Counties			
	n	Weighted Proportion % (95% C.I.)	n	Weighted Proportion % (95% C.I.)	n	Weighted Proportion % (95% C.I.)	n	Weighted Proportion % (95% C.I.)
Year	**47,709**	**100.0 (---------)**	**1,903**	**100.0 (---------)**	**4,997**	**100.0 (---------)**	**40,809**	**100.0 (---------)**
2008	8,600	20.3 (19.7-20.9)	400	20.6 (18.4-22.8)	1,003	20.3 (18.9-21.7)	7,197	20.3 (19.6-21.0)
2009	9,614	20.0 (19.5-20.6)	361	19.7 (17.6-22.0)	1,042	20.2 (18.9-21.5)	8,211	20.0 (19.4-20.6)
2010	9,214	19.7 (19.2-20.2)	366	20.9 (18.8-23.1)	925	19.4 (18.2-20.6)	7,923	19.7 (19.1-20.3)
2011	11,228	20.0 (19.5-20.6)	404	19.8 (17.7-22.2)	1,124	20.0 (18.7-21.4)	9,700	20.1 (19.5-20.6)
2012	9,053	19.9 (19.4-20.5)	372	19.0 (16.7-21.6)	903	20.2 (18.8-21.7)	7,778	19.9 (19.3-20.6)
Age of Teen (years)	**47,709**	**100.0 (---------)**	**1,903**	**100.0 (---------)**	**4,997**	**100.0 (---------)**	**40,809**	**100.0 (---------)**
13	9,523	19.6 (18.9-20.2)	413	21.3 (18.9-23.8)	1,010	20.3 (18.8-21.9)	8,100	19.4 (18.7-20.1)
14	9,813	19.8 (19.1-20.5)	417	20.4 (18.2-22.8)	1,022	19.0 (17.5-20.5)	8,374	19.9 (19.1-20.6)
15	9,802	21.2 (20.5-21.9)	358	19.0 (16.8-21.4)	1,071	22.2 (20.6-23.8)	8,373	21.2 (20.4-22.0)
16	9,732	20.6 (19.9-21.3)	387	20.9 (18.4-23.5)	992	20.5 (18.9-22.1)	8,353	20.6 (19.8-21.4)
17	8,839	18.8 (18.2-19.5)	328	18.5 (16.3-21.0)	902	18.1 (16.7-19.6)	7,609	18.9 (18.2-19.7)
Race / ethnicity	**47,709**	**100.0 (---------)**	**1,903**	**100.0 (---------)**	**4,997**	**100.0 (---------)**	**40,809**	**100.0 (---------)**
White, non-Hispanic	32,689	57.9 (57.1-58.8)	1,200	52.6 (49.5-55.6)	3,510	66.3 (64.3-68.2)	27,979	57.1 (56.2-58.1)
Black, non-Hispanic	4,973	14.9 (14.3-15.6)	573	40.6 (37.6-43.7)	739	17.6 (16.0-19.3)	3,661	13.7 (13.0-14.4)
Hispanic	6,137	19.4 (18.6-20.2)	60	3.5 (2.5-4.9)	479	10.6 (9.3-12.1)	5,598	20.9 (20.1-21.8)
Other	3,910	7.8 (7.3-8.3)	70	3.4 (2.5-4.5)	269	5.5 (4.6-6.5)	3,571	8.2 (7.7-8.8)
Mother's Education	**47,709**	**100.0 (---------)**	**1,903**	**100.0 (---------)**	**4,997**	**100.0 (---------)**	**40,809**	**100.0 (---------)**
<High school	4,539	13.8 (13.2-14.5)	206	14.1 (12.0-16.5)	509	12.0 (10.7-13.4)	3,824	14.0 (13.3-14.8)
High school graduates	9,402	26.0 (25.2-26.8)	507	32.1 (29.3-35.0)	1,098	27.8 (26.0-29.7)	7,797	25.5 (24.7-26.4)
> High school graduate, some college	13,738	26.6 (25.9-27.3)	545	27.9 (25.2-30.7)	1,492	27.6 (25.9-29.3)	11,701	26.4 (25.7-27.2)
College graduate	20,030	33.6 (32.9-34.3)	645	25.9 (23.7-28.3)	1,898	32.6 (30.9-34.4)	17,487	34.0 (33.2-34.8)
Mother's marital status	**47,287**	**100.0 (---------)**	**1,878**	**100.0 (---------)**	**4,942**	**100.0 (---------)**	**40,467**	**100.0 (---------)**
Married	35,854	70.5 (69.7-71.3)	1,279	57.7 (54.6-60.7)	3,666	69.2 (67.3-71.1)	30,909	71.1 (70.2-72.0)
Divorced / Widowed / Separated	8,038	20.1 (19.4-20.8)	401	25.4 (22.8-28.2)	870	21.8 (20.1-23.6)	6,767	19.7 (18.9-20.5)
Never Married	3,395	9.4 (8.9-10.0)	198	16.9 (14.4-19.8)	406	9.0 (7.8-10.3)	2,791	9.2 (8.6-9.8)

Table 1. Characteristics of adolescent females aged 13-17 years by age at interview, National Immunization Survey-Teen, United States, 2008 - 2012

Sociodemographic Characteristics	United States		Delta Regional Authority States (DRA)				Rest of US	
			DRA Counties		Non-DRA Counties			
	n	Weighted Proportion % (95% C.I.)	n	Weighted Proportion % (95% C.I.)	n	Weighted Proportion % (95% C.I.)	n	Weighted Proportion % (95% C.I.)
Mother's Age (years)	**47,709**	**100.0 (---------)**	**1,903**	**100.0 (---------)**	**4,997**	**100.0 (---------)**	**40,809**	**100.0 (---------)**
≤34 years	3,514	9.4 (8.9-10.0)	228	16.9 (14.5-19.6)	445	11.5 (10.1-13.0)	2,841	8.9 (8.4-9.5)
35–44 years	19,975	45.5 (44.7-46.4)	883	48.4 (45.5-51.5)	2,246	47.1 (45.1-49.0)	16,846	45.2 (44.3-46.2)
≥45 years	24,220	45.0 (44.2-45.9)	792	34.7 (32.0-37.4)	2,306	41.5 (39.6-43.4)	21,122	45.8 (44.9-46.7)
Teen had a preventive care visit at age 11 or 12 years	**47,217**	**100.0 (---------)**	**1,866**	**100.0 (---------)**	**4,943**	**100.0 (---------)**	**40,408**	**100.0 (---------)**
Yes visit	41,572	87.4 (86.8-88.0)	1,515	82.6 (80.3-84.6)	4,294	87.6 (86.3-88.8)	35,763	87.6 (86.9-88.2)
No visit	5,645	12.6 (12.0-13.2)	351	17.4 (15.4-19.7)	649	12.4 (11.2-13.7)	4,645	12.4 (11.8-13.1)
Income to poverty ratio	**47,709**	**100.0 (---------)**	**1,903**	**100.0 (---------)**	**4,997**	**100.0 (---------)**	**40,809**	**100.0 (---------)**
<133%	9,871	29.1 (28.3-29.9)	565	39.6 (36.5-42.7)	1,169	28.8 (26.9-30.7)	8,137	28.8 (27.8-29.7)
133% - <322%	14,574	30.6 (29.9-31.4)	579	31.8 (29.1-34.6)	1,617	32.8 (31.0-34.6)	12,378	30.3 (29.5-31.2)
322% - <503%	11,227	19.7 (19.1-20.4)	399	15.3 (13.6-17.1)	1,158	21.3 (19.8-22.8)	9,670	19.7 (19.1-20.4)
>503%	12,037	20.5 (19.9-21.2)	360	13.4 (11.8-15.1)	1,053	17.2 (15.9-18.5)	10,624	21.2 (20.5-21.9)
Vaccination payment source	**47,589**	**100.0 (---------)**	**1,901**	**100.0 (---------)**	**4,986**	**100.0 (---------)**	**40,702**	**100.0 (---------)**
Private Only	29,716	55.6 (54.8-56.5)	981	43.6 (40.7-46.5)	3,029	56.1 (54.1-58.0)	25,706	56.0 (55.0-56.9)
Medicaid / CHIP	11,728	31.8 (31.0-32.6)	694	45.2 (42.1-48.2)	1,446	34.0 (32.1-36.0)	9,588	31.1 (30.1-32.0)
Uninsured	2,249	6.3 (5.8-6.8)	108	6.1 (4.9-7.6)	180	4.0 (3.3-4.8)	1,961	6.6 (6.0-7.1)
Military	1,143	2.0 (1.8-2.2)	35	1.8 (1.2-2.9)	90	1.8 (1.4-2.4)	1,018	2.0 (1.8-2.3)
Other / IHS / AIAN(All)	2,753	4.3 (4.0-4.6)	83	3.3 (2.5-4.2)	241	4.1 (3.5-4.9)	2,429	4.4 (4.0-4.7)
Received provider recommendation for HPV vaccination	**46,089**	**100.0 (---------)**	**1,835**	**100.0 (---------)**	**4,820**	**100.0 (---------)**	**39,434**	**100.0 (---------)**
Yes	27,735	57.0 (56.1-57.8)	883	45.0 (42.0-48.0)	2,674	54.5 (52.5-56.4)	24,178	57.7 (56.7-58.6)
No	18,354	43.0 (42.2-43.9)	952	55.0 (52.0-58.0)	2,146	45.5 (43.6-47.5)	15,256	42.3 (41.4-43.3)
Knowledge about HPV Vaccine	**38,297**	**100.0 (---------)**	**1,513**	**100.0 (---------)**	**4,043**	**100.0 (---------)**	**32,741**	**100.0 (---------)**
Yes	36,043	91.1 (90.4-91.8)	1,385	88.3 (85.7-90.4)	3,768	91.3 (89.9-92.6)	30,890	91.2 (90.3-91.9)
No	2,254	8.9 (8.2-9.6)	128	11.7 (9.6-14.3)	275	8.7 (7.4-10.1)	1,851	8.8 (8.1-9.7)
Heard about HPV vaccine	**38,070**	**100.0 (---------)**	**1,505**	**100.0 (---------)**	**4,015**	**100.0 (---------)**	**32,550**	**100.0 (---------)**
Yes	33,256	84.3 (83.5-85.1)	1,236	79.3 (76.5-81.9)	3,448	83.8 (82.1-85.5)	28,572	84.5 (83.6-85.4)
No	4,814	15.7 (14.9-16.5)	269	20.7 (18.1-23.5)	567	16.2 (14.5-17.9)	3,978	15.5 (14.6-16.4)

Table 1. Characteristics of adolescent females aged 13-17 years by age at interview, National Immunization Survey-Teen, United States, 2008 - 2012

Sociodemographic Characteristics	United States		Delta Regional Authority States (DRA)				Rest of US	
			DRA Counties		Non-DRA Counties			
	n	Weighted Proportion % (95% C.I.)	n	Weighted Proportion % (95% C.I.)	n	Weighted Proportion % (95% C.I.)	n	Weighted Proportion % (95% C.I.)
Number of Total Providers	47,709	100.0 (---------)	1,903	100.0 (---------)	4,997	100.0 (---------)	40,809	100.0 (---------)
1	24,471	53.0 (52.2-53.8)	856	45.9 (42.9-48.9)	2,528	50.7 (48.7-52.6)	21,087	53.5 (52.6-54.4)
2 - 3	14,679	30.0 (29.2-30.8)	704	37.4 (34.5-40.4)	1,607	31.8 (30.0-33.6)	12,368	29.5 (28.7-30.4)
4 or more	8,559	17.0 (16.4-17.7)	343	16.6 (14.6-18.9)	862	17.5 (16.1-19.1)	7,354	17.0 (16.3-17.7)
Physician contacts within past year	47,403	100.0 (---------)	1,885	100.0 (---------)	4,962	100.0 (---------)	40,556	100.0 (---------)
None	6,782	16.2 (15.6-16.9)	268	17.2 (14.9-19.7)	666	14.6 (13.2-16.0)	5,848	16.4 (15.7-17.1)
1	12,371	26.3 (25.5-27.0)	429	22.0 (19.7-24.5)	1,248	25.0 (23.4-26.7)	10,694	26.5 (25.7-27.4)
2 - 3	17,571	36.4 (35.6-37.2)	699	36.1 (33.3-39.1)	1,892	37.6 (35.7-39.5)	14,980	36.3 (35.4-37.2)
4 or more	10,679	21.1 (20.5-21.8)	489	24.7 (22.2-27.4)	1,156	22.9 (21.3-24.5)	9,034	20.8 (20.1-21.5)
Facility Type	47,581	100.0 (---------)	1,900	100.0 (---------)	4,981	100.0 (---------)	40,700	100.0 (---------)
Private	24,723	55.1 (54.3-55.9)	644	33.5 (30.8-36.4)	2,350	47.3 (45.3-49.2)	21,729	56.8 (55.9-57.7)
Public	8,211	17.5 (16.9-18.2)	665	37.7 (34.8-40.7)	1,173	22.8 (21.3-24.5)	6,373	16.2 (15.5-16.9)
Hospital	3,965	7.2 (6.8-7.6)	117	6.2 (5.0-7.8)	324	7.4 (6.4-8.6)	3,524	7.2 (6.8-7.7)
Mixed	9,158	17.1 (16.5-17.7)	436	20.7 (18.5-23.1)	994	19.6 (18.1-21.1)	7,728	16.6 (16.0-17.3)
Other	1,524	3.1 (2.8-3.4)	38	1.8 (1.2-2.6)	140	3.0 (2.4-3.7)	1,346	3.2 (2.8-3.5)
MSA	47,709	100.0 (---------)	1,903	100.0 (---------)	4,997	100.0 (---------)	40,809	100.0 (---------)
Urban area	18,592	38.9 (38.1-39.7)	436	25.3 (22.7-28.2)	1,941	32.8 (31.1-34.5)	16,215	40.1 (39.2-41.0)
Suburban area	18,049	45.0 (44.2-45.9)	568	27.3 (24.8-29.9)	1,936	46.7 (44.8-48.7)	15,545	45.5 (44.5-46.4)
Rural area	11,068	16.1 (15.6-16.6)	899	47.4 (44.4-50.3)	1,120	20.5 (19.1-22.0)	9,049	14.4 (13.9-15.0)

Table 2. Unadjusted and Adjusted (Multivariate) logistic regression analysis for 1+ HPV vaccination coverage estimates among adolescent females aged 13-17 years by age at interview for selected sociodemographic characteristics, National Immunization Survey-Teen, United States, 2008 - 2012

Sociodemographic Characteristics	United States			Delta Regional Authority States (DRA)						Rest of US		
				DRA Counties			Non-DRA Counties					
	Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value
Total	47.4 (46.6-48.2)			40.9 (38.0-43.9)			40.0 (38.1-41.9)			48.5 (47.6-49.4)*		
Year												
2008	37.2 (35.2-39.3)†	0.80 (0.76-0.85)	0.00	25.3 (20.1-31.3)†	0.70 (0.54-0.89)	0.00	28.9 (25.2-33.0)†	0.76 (0.65-0.88)	0.00	38.6 (36.3-41.0)*†	0.81 (0.76-0.87)	0.00
2009	44.3 (42.4-46.1)†	0.90 (0.85-0.95)	0.00	40.2 (33.7-47.0)	0.89 (0.72-1.09)	0.26	34.6 (30.9-38.4)†	0.81 (0.70-0.93)	0.00	45.6 (43.5-47.6)†	0.91 (0.86-0.96)	0.00
2010	48.7 (46.9-50.6)†	0.99 (0.94-1.04)	0.64	41.2 (35.4-47.3)	0.97 (0.80-1.19)	0.80	39.7 (36.0-43.7)†	0.94 (0.82-1.07)	0.35	50.1 (48.0-52.1)*†	0.99 (0.94-1.05)	0.82
2011	53.1 (51.4-54.7)	1.03 (0.99-1.08)	0.16	48.9 (42.1-55.7)	1.04 (0.84-1.29)	0.69	48.8 (44.4-53.1)	1.04 (0.91-1.18)	0.60	53.7 (51.9-55.5)	1.03 (0.98-1.09)	0.22
2012	53.9 (52.0-55.7)	ref		49.7 (42.2-57.3)	ref		47.9 (43.2-52.7)	ref		54.7 (52.7-56.8)	ref	
Age of Teen (years)												
13	40.0 (38.3-41.8)†	0.76 (0.72-0.80)	0.00	37.9 (31.9-44.4)	0.87 (0.70-1.10)	0.25	33.5 (29.6-37.7)†	0.80 (0.69-0.93)	0.00	40.9 (39.0-42.9)†	0.75 (0.71-0.80)	0.00
14	43.5 (41.7-45.3)†	0.83 (0.78-0.87)	0.00	37.5 (31.7-43.7)	0.93 (0.76-1.14)	0.49	37.4 (33.2-41.7)	0.82 (0.71-0.95)	0.01	44.4 (42.4-46.5)*†	0.82 (0.78-0.87)	0.00
15	49.9 (48.0-51.8)†	0.93 (0.89-0.98)	0.00	48.3 (41.6-55.0)	1.15 (0.95-1.39)	0.15	42.2 (38.2-46.3)	0.96 (0.85-1.09)	0.55	50.9 (48.8-53.0)†	0.92 (0.88-0.97)	0.00
16	50.6 (48.7-52.5)	0.96 (0.91-1.01)	0.09	40.8 (34.2-47.7)	1.02 (0.84-1.23)	0.85	44.2 (39.8-48.6)	1.02 (0.90-1.16)	0.73	51.7 (49.6-53.8)*	0.95 (0.90-1.00)	0.07
17	52.8 (50.8-54.8)	ref		40.6 (33.8-47.7)	ref		42.3 (37.9-46.9)	ref		54.4 (52.2-56.6)*	ref	
Race / ethnicity												
White, non-Hispanic	44.5 (43.6-45.4)	ref		37.0 (33.5-40.6)	ref		38.8 (36.7-41.0)	ref		45.5 (44.5-46.5)*	ref	
Black, non-Hispanic	46.9 (44.5-49.3)	0.99 (0.93-1.05)	0.64	44.9 (39.7-50.2)†	1.01 (0.86-1.18)	0.94	41.6 (36.5-46.8)	1.00 (0.87-1.16)	0.98	47.9 (45.1-50.8)	0.98 (0.92-1.05)	0.58
Hispanic	55.5 (53.1-57.9)†	1.21 (1.15-1.27)	0.00	49.9 (33.4-66.4)	1.11 (0.79-1.56)	0.56	44.9 (38.0-52.1)	1.12 (0.94-1.33)	0.22	56.2 (53.6-58.7)†	1.20 (1.14-1.27)	0.00
Other	49.8 (46.6-53.0)†	1.11 (1.04-1.18)	0.00	43.7 (30.3-58.0)	1.05 (0.77-1.43)	0.76	39.1 (31.2-47.7)	1.00 (0.83-1.21)	0.99	50.7 (47.2-54.1)†	1.11 (1.03-1.18)	0.00
Mother's Education												
<High school	54.7 (52.0-57.4)	ref		49.6 (40.9-58.4)	ref		40.6 (34.6-46.9)	ref		56.3 (53.3-59.2)	ref	
High school graduates	46.6 (44.7-48.4)†	0.88 (0.83-0.94)	0.00	40.7 (35.4-46.2)	0.86 (0.69-1.06)	0.17	40.2 (36.3-44.3)	1.06 (0.88-1.27)	0.54	47.7 (45.6-49.7)*†	0.87 (0.81-0.93)	0.00
> High school graduate, some college	45.6 (44.1-47.1)†	0.86 (0.81-0.91)	0.00	37.7 (32.1-43.6)†	0.78 (0.63-0.97)	0.03	38.1 (34.7-41.5)	0.97 (0.81-1.17)	0.75	46.8 (45.1-48.5)*†	0.85 (0.80-0.91)	0.00
College graduate	46.5 (45.2-47.7)†	0.85 (0.80-0.91)	0.00	39.9 (35.3-44.7)	0.82 (0.65-1.03)	0.10	41.1 (38.1-44.2)	1.05 (0.86-1.27)	0.65	47.2 (45.9-48.6)*†	0.84 (0.78-0.90)	0.00
Mother's marital status												
Married	45.4 (44.5-46.4)	ref		36.2 (32.9-39.6)	ref		39.0 (36.8-41.1)	ref		46.4 (45.4-47.5)*	ref	
Divorced / Widowed / Separated	50.1 (48.1-52.0)†	1.03 (0.98-1.08)	0.21	43.7 (37.7-50.0)†	1.10 (0.93-1.30)	0.28	40.6 (36.1-45.2)	0.94 (0.83-1.07)	0.37	51.6 (49.3-53.8)*†	1.04 (0.99-1.10)	0.12
Never Married	56.1 (53.0-59.2)†	1.09 (1.01-1.17)	0.03	52.8 (43.8-61.7)†	1.17 (0.93-1.47)	0.20	46.8 (39.6-54.1)†	1.11 (0.93-1.32)	0.28	57.4 (53.8-60.8)†	1.08 (1.00-1.17)	0.06

Table 2. Unadjusted and Adjusted (Multivariate) logistic regression analysis for 1+ HPV vaccination coverage estimates among adolescent females aged 13-17 years by age at interview for selected sociodemographic characteristics, National Immunization Survey-Teen, United States, 2008 - 2012

Sociodemographic Characteristics	United States			Delta Regional Authority States (DRA)						Rest of US		
				DRA Counties			Non-DRA Counties					
	Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value
Mother's Age (years)												
≤34 years	53.9 (50.9-56.8)	ref		48.9 (40.5-57.4)	ref		44.6 (38.0-51.3)	ref		55.6 (52.1-59.0)	ref	
35–44 years	46.5 (45.2-47.8)†	0.90 (0.85-0.96)	0.00	37.3 (33.2-41.6)†	0.83 (0.67-1.02)	0.09	39.4 (36.6-42.3)	0.91 (0.78-1.07)	0.27	47.7 (46.2-49.2)*†	0.90 (0.84-0.97)	0.01
≥45 years	47.0 (45.8-48.1)†	0.89 (0.84-0.95)	0.00	42.0 (37.7-46.5)	0.94 (0.76-1.16)	0.57	39.3 (36.6-42.1)	0.90 (0.76-1.06)	0.21	47.9 (46.6-49.2)*†	0.89 (0.82-0.95)	0.00
Teen had a preventive care visit at age 11 or 12 years												
Yes visit	49.2 (48.3-50.1)	ref		44.7 (41.4-48.1)	ref		41.4 (39.4-43.5)	ref		50.3 (49.3-51.3)*	ref	
No visit	37.4 (34.9-39.9)†	0.92 (0.87-0.98)	0.01	26.1 (20.8-32.2)†	0.78 (0.64-0.94)	0.01	31.1 (26.4-36.4)†	1.03 (0.89-1.18)	0.70	38.7 (35.9-41.5)*†	0.92 (0.86-0.98)	0.01
Income to poverty ratio												
<133%	54.3 (52.5-56.1)†	1.00 (0.94-1.07)	0.96	50.1 (44.7-55.5)	1.03 (0.81-1.31)	0.80	44.9 (40.9-49.0)	1.09 (0.92-1.28)	0.31	55.6 (53.6-57.6)†	0.99 (0.92-1.06)	0.80
133% - <322%	41.6 (40.2-43.0)†	0.86 (0.82-0.90)	0.00	30.6 (26.0-35.6)†	0.84 (0.68-1.02)	0.08	35.6 (32.4-38.8)†	0.91 (0.80-1.04)	0.17	42.8 (41.1-44.4)*†	0.86 (0.81-0.90)	0.00
322% - <503%	43.5 (41.9-45.1)†	0.91 (0.87-0.95)	0.00	37.9 (32.4-43.6)	0.91 (0.76-1.09)	0.30	35.7 (32.2-39.4)†	0.86 (0.76-0.98)	0.02	44.6 (42.9-46.4)†	0.92 (0.88-0.97)	0.00
>503%	50.0 (48.3-51.7)	ref		41.7 (35.5-48.1)	ref		45.3 (41.3-49.4)	ref		50.7 (48.8-52.5)*	ref	
Vaccination payment source												
Private Only	44.1 (43.1-45.1)	ref		32.4 (28.7-36.3)	ref		38.2 (35.9-40.5)*	ref		45.1 (44.0-46.3)*	ref	
Medicaid / CHIPS	55.8 (54.2-57.5)†	1.16 (1.10-1.22)	0.00	51.5 (46.6-56.4)†	1.37 (1.12-1.67)	0.00	44.7 (41.0-48.5)*†	1.09 (0.96-1.25)	0.18	57.5 (55.6-59.3)*†	1.16 (1.09-1.23)	0.00
Uninsured	35.3 (31.8-39.0)†	0.91 (0.82-1.01)	0.07	25.0 (16.7-35.7)	1.01 (0.72-1.44)	0.94	26.0 (18.5-35.3)†	0.99 (0.78-1.27)	0.95	36.3 (32.5-40.3)*†	0.89 (0.80-1.00)	0.04
Military	44.7 (39.1-50.4)	0.98 (0.88-1.11)	0.79	35.2 (18.2-56.9)	1.22 (0.80-1.88)	0.39	46.9 (32.9-61.4)	1.23 (0.93-1.63)	0.19	44.8 (38.7-51.0)	0.95 (0.84-1.08)	0.41
Other / IHS / AIAN(All)	46.7 (43.0-50.3)	1.01 (0.93-1.09)	0.86	40.5 (28.9-53.2)	1.02 (0.73-1.42)	0.91	36.7 (28.9-45.3)	0.89 (0.72-1.11)	0.29	47.9 (43.9-52.0)	1.01 (0.92-1.11)	0.81
Received provider recommendation for HPV vaccination												
Yes	61.5 (60.4-62.6)	ref		58.9 (54.7-63.0)	ref		56.2 (53.6-58.8)	ref		62.2 (61.0-63.3)	ref	
No	28.9 (27.6-30.2)†	0.49 (0.47-0.51)	0.00	25.4 (21.7-29.4)†	0.48 (0.41-0.57)	0.00	21.1 (18.8-23.5)†	0.40 (0.35-0.45)	0.00	30.0 (28.6-31.5)*†	0.50 (0.48-0.53)	0.00
Do you know about HPV Vaccine		NA			NA			NA			NA	
Yes	47.0 (46.1-48.0)			39.4 (36.1-42.7)			39.9 (37.7-42.0)			48.1 (47.1-49.2)*		
No	34.0 (29.9-38.4)†			31.9 (22.4-43.3)			20.0 (14.4-27.2)†			35.7 (31.1-40.7)†		

35

Table 2. Unadjusted and Adjusted (Multivariate) logistic regression analysis for 1+ HPV vaccination coverage estimates among adolescent females aged 13-17 years by age at interview for selected sociodemographic characteristics, National Immunization Survey-Teen, United States, 2008 - 2012

Sociodemographic Characteristics	United States			Delta Regional Authority States (DRA) DRA Counties			Non-DRA Counties			Rest of US		
	Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value
Have you heard about HPV vaccine		NA			NA			NA			NA	
Yes	46.8 (45.8-47.8)			39.8 (36.3-43.5)			39.3 (37.1-41.6)			47.9 (46.8-49.0)*		
No	40.9 (38.1-43.8)†			33.0 (26.6-40.1)			31.5 (26.5-37.0)†			42.4 (39.2-45.7)*†		
Number of Total Providers												
1	48.0 (46.9-49.2)	ref		41.5 (37.3-45.9)	ref		39.9 (37.2-42.6)	ref		49.1 (47.8-50.4)*	ref	
2 - 3	45.5 (44.0-47.0)†	0.92 (0.88-0.95)	0.00	38.0 (33.2-42.9)	0.91 (0.78-1.07)	0.27	38.0 (34.8-41.3)	0.94 (0.85-1.05)	0.26	46.8 (45.0-48.5)*†	0.92 (0.88-0.96)	0.00
4 or more	48.9 (46.9-50.9)	0.91 (0.86-0.96)	0.00	45.8 (38.8-52.9)	0.97 (0.80-1.18)	0.76	43.8 (39.1-48.5)	0.95 (0.82-1.08)	0.42	49.6 (47.3-51.8)	0.91 (0.86-0.96)	0.00
Physician contacts within past year												
None	34.9 (32.9-37.1)†	0.77 (0.73-0.83)	0.00	31.7 (24.9-39.3)†	0.83 (0.67-1.03)	0.09	27.1 (22.8-31.9)†	0.75 (0.63-0.90)	0.00	35.9 (33.6-38.2)†	0.77 (0.72-0.83)	0.00
1	44.9 (43.3-46.5)†	0.89 (0.85-0.93)	0.00	41.3 (35.4-47.4)	1.02 (0.85-1.21)	0.84	38.3 (34.7-42.1)	1.01 (0.90-1.14)	0.85	45.7 (43.9-47.5)†	0.87 (0.83-0.91)	0.00
2 - 3	50.4 (49.0-51.8)†	0.95 (0.91-0.99)	0.01	41.0 (36.1-46.0)	0.88 (0.75-1.02)	0.10	43.6 (40.4-46.9)	1.02 (0.91-1.14)	0.77	51.6 (50.0-53.1)*†	0.94 (0.90-0.98)	0.01
4 or more	54.6 (52.9-56.3)	ref		46.8 (40.7-52.9)	ref		43.8 (39.9-47.7)	ref		56.3 (54.4-58.2)*	ref	
Facility Type												
Private	48.7 (47.6-49.9)	ref		50.3 (45.2-55.4)	ref		43.4 (40.7-46.2)*	ref		49.2 (48.0-50.4)	ref	
Public	38.5 (36.5-40.5)†	0.85 (0.80-0.90)	0.00	27.5 (23.1-32.3)†	0.74 (0.61-0.89)	0.00	28.0 (24.5-31.8)†	0.77 (0.67-0.89)	0.00	41.1 (38.7-43.5)*†	0.87 (0.82-0.93)	0.00
Hospital	53.7 (50.8-56.6)†	1.05 (0.99-1.12)	0.08	48.4 (37.0-60.0)	1.03 (0.80-1.31)	0.83	47.4 (39.5-55.4)	1.05 (0.90-1.22)	0.58	54.6 (51.4-57.7)†	1.06 (1.00-1.13)	0.07
Mixed	51.1 (49.1-53.1)†	1.06 (1.01-1.11)	0.02	49.0 (42.9-55.0)	1.03 (0.85-1.24)	0.77	43.7 (39.5-48.0)	1.03 (0.90-1.17)	0.70	52.2 (50.0-54.4)†	1.07 (1.01-1.12)	0.02
Other	42.1 (37.3-47.2)†	0.92 (0.83-1.02)	0.11	31.0 (15.9-51.7)	0.50 (0.20-1.22)	0.07	36.3 (26.7-47.1)	0.87 (0.66-1.16)	0.33	43.0 (37.6-48.5)†	0.94 (0.84-1.04)	0.22
MSA												
Urban area	50.7 (49.2-52.1)†	1.09 (1.04-1.14)	0.00	49.9 (43.4-56.4)†	1.17 (0.98-1.40)	0.08	45.6 (42.4-48.8)†	1.12 (0.99-1.28)	0.07	51.2 (49.6-52.7)†	1.07 (1.02-1.13)	0.01
Suburban area	47.1 (45.8-48.4)†	1.06 (1.01-1.11)	0.02	42.4 (37.3-47.6)†	1.13 (0.97-1.31)	0.12	38.5 (35.6-41.4)	0.97 (0.86-1.11)	0.69	48.2 (46.8-49.7)†	1.06 (1.00-1.11)	0.03
Rural area	40.3 (38.8-41.9)	ref		35.2 (31.1-39.5)	ref		34.4 (30.7-38.4)	ref		41.9 (40.0-43.8)	ref	

* p-value < 0.05 compared with DRA Counties; † p-value < 0.05 compared with reference level; NA= Not Applicable

Table 3. Unadjusted and Adjusted (Multivariate) logistic regression analysis for 2+ HPV vaccination coverage estimates among adolescent females aged 13-17 years by age at interview for selected sociodemographic characteristics, National Immunization Survey-Teen, United States, 2008 - 2012

| Sociodemographic Characteristics | United States | | | Delta Regional Authority States (DRA) | | | | | | Rest of US | | |
| | | | | DRA Counties | | | Non-DRA Counties | | | | | |
	Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value
Total	38.4 (37.6-39.2)			31.6 (28.8-34.4)			31.7 (30.0-33.6)			39.4 (38.5-40.3)*		
Year												
2008	28.3 (26.4-30.3)†	0.75 (0.70-0.81)	0.00	18.3 (13.7-24.1)†	0.71 (0.52-0.96)	0.02	21.5 (18.1-25.2)†	0.74 (0.61-0.90)	0.00	29.5 (27.3-31.7)*†	0.75 (0.70-0.82)	0.00
2009	35.9 (34.1-37.6)†	0.89 (0.83-0.95)	0.00	30.4 (24.4-37.2)	0.86 (0.66-1.11)	0.25	28.8 (25.4-32.6)†	0.88 (0.75-1.04)	0.15	36.9 (34.9-38.8)†	0.89 (0.83-0.95)	0.00
2010	40.7 (38.9-42.5)†	1.03 (0.97-1.09)	0.40	32.5 (27.1-38.3)	1.04 (0.82-1.32)	0.74	32.5 (29.0-36.3)	1.03 (0.88-1.20)	0.70	41.9 (40.0-43.9)*	1.03 (0.96-1.09)	0.46
2011	43.9 (42.3-45.6)	1.06 (1.00-1.12)	0.05	40.0 (33.4-46.9)	1.14 (0.89-1.47)	0.30	39.8 (35.5-44.3)	1.13 (0.97-1.32)	0.13	44.6 (42.7-46.4)	1.05 (0.99-1.11)	0.13
2012	43.4 (41.5-45.2)	ref		37.3 (30.6-44.6)	ref		36.2 (31.9-40.9)	ref		44.4 (42.4-46.5)	ref	
Age of Teen (years)												
13	30.3 (28.7-32.0)†	0.69 (0.65-0.74)	0.00	28.2 (22.7-34.4)	0.82 (0.62-1.09)	0.17	24.1 (20.6-27.9)†	0.70 (0.58-0.84)	0.00	31.2 (29.4-33.0)†	0.69 (0.64-0.74)	0.00
14	33.9 (32.3-35.7)†	0.78 (0.73-0.83)	0.00	25.8 (20.8-31.6)	0.79 (0.60-1.03)	0.08	29.2 (25.3-33.4)†	0.79 (0.66-0.93)	0.01	34.8 (32.9-36.7)*†	0.78 (0.73-0.84)	0.00
15	40.7 (38.8-42.5)†	0.91 (0.86-0.96)	0.00	42.0 (35.5-48.8)†	1.26 (1.00-1.58)	0.04	33.5 (29.8-37.5)*	0.95 (0.82-1.11)	0.54	41.5 (39.4-43.6)†	0.90 (0.84-0.96)	0.00
16	42.3 (40.5-44.1)	0.95 (0.90-1.01)	0.10	31.6 (25.6-38.2)	1.02 (0.81-1.30)	0.85	36.6 (32.5-40.9)	1.02 (0.89-1.19)	0.74	43.3 (41.3-45.4)*	0.95 (0.89-1.01)	0.07
17	44.7 (42.7-46.7)	ref		31.0 (24.8-38.0)	ref		35.3 (31.1-39.8)	ref		46.2 (44.0-48.4)*	ref	
Race / ethnicity												
White, non-Hispanic	37.2 (36.3-38.1)	ref		30.5 (27.1-34.0)	ref		31.3 (29.3-33.3)	ref		38.2 (37.2-39.2)*	ref	
Black, non-Hispanic	35.7 (33.3-38.0)	0.94 (0.87-1.01)	0.09	31.7 (27.0-36.8)	0.86 (0.69-1.07)	0.18	30.4 (25.7-35.5)	0.93 (0.77-1.12)	0.44	36.9 (34.1-39.7)	0.94 (0.87-1.02)	0.15
Hispanic	43.2 (40.8-45.5)†	1.20 (1.12-1.27)	0.00	44.4 (28.4-61.6)	1.21 (0.83-1.77)	0.35	37.7 (31.0-44.9)	1.19 (0.98-1.44)	0.09	43.5 (41.0-46.0)†	1.19 (1.11-1.27)	0.00
Other	40.9 (37.8-44.1)†	1.11 (1.03-1.20)	0.01	33.6 (21.8-47.8)	0.98 (0.68-1.42)	0.92	30.2 (23.2-38.1)	0.93 (0.74-1.17)	0.52	41.8 (38.5-45.3)†	1.12 (1.03-1.21)	0.01
Mother's Education												
<High school	41.2 (38.6-43.9)	ref		34.4 (26.6-43.1)	ref		30.9 (25.5-36.9)	ref		42.5 (39.6-45.5)	ref	
High school graduates	36.6 (34.9-38.4)†	0.88 (0.81-0.95)	0.00	31.4 (26.4-36.8)	0.86 (0.65-1.13)	0.29	30.8 (27.2-34.7)	0.96 (0.78-1.20)	0.75	37.6 (35.6-39.6)*†	0.87 (0.80-0.95)	0.00
> High school graduate, some college	36.9 (35.5-38.4)†	0.87 (0.80-0.94)	0.00	30.5 (25.2-36.3)	0.86 (0.66-1.13)	0.30	29.5 (26.4-32.8)	0.93 (0.75-1.14)	0.49	38.1 (36.5-39.7)*†	0.86 (0.79-0.94)	0.00
College graduate	39.8 (38.6-41.0)	0.87 (0.80-0.95)	0.00	31.4 (27.3-35.9)	0.85 (0.64-1.14)	0.29	34.7 (31.8-37.7)	1.04 (0.83-1.29)	0.75	40.5 (39.2-41.9)*	0.86 (0.79-0.94)	0.00
Mother's marital status												
Married	37.6 (36.7-38.6)	ref		28.8 (25.7-32.0)	ref		31.4 (29.4-33.5)	ref		38.6 (37.5-39.6)*	ref	
Divorced / Widowed / Separated	39.1 (37.3-41.1)	0.99 (0.94-1.05)	0.81	32.3 (26.8-38.4)	1.07 (0.86-1.33)	0.53	31.4 (27.3-35.8)	0.95 (0.81-1.11)	0.54	40.5 (38.3-42.6)*	1.00 (0.94-1.06)	0.99
Never Married	42.4 (39.4-45.5)†	1.06 (0.97-1.15)	0.22	40.8 (32.2-50.0)†	1.21 (0.91-1.61)	0.20	36.9 (30.0-44.5)	1.22 (0.99-1.50)	0.08	43.1 (39.7-46.6)†	1.04 (0.94-1.14)	0.48

Table 3. Unadjusted and Adjusted (Multivariate) logistic regression analysis for 2+ HPV vaccination coverage estimates among adolescent females aged 13-17 years by age at interview for selected sociodemographic characteristics, National Immunization Survey-Teen, United States, 2008 - 2012

Sociodemographic Characteristics	United States — Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	DRA Counties — Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Non-DRA Counties — Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Rest of US — Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value
Mother's Age (years)												
≤34 years	37.3 (34.5-40.3)	ref		40.0 (31.9-48.7)	ref		29.4 (23.7-35.8)	ref		38.4 (35.0-41.8)	ref	
35–44 years	37.1 (35.8-38.4)	1.02 (0.93-1.11)	0.69	28.0 (24.3-32.0)†	0.71 (0.55-0.90)	0.01	31.2 (28.5-33.9)	1.09 (0.88-1.35)	0.45	38.2 (36.8-39.6)*	1.02 (0.93-1.13)	0.62
≥45 years	39.9 (38.8-41.1)	1.04 (0.95-1.13)	0.43	32.5 (28.4-36.8)	0.82 (0.63-1.05)	0.12	33.0 (30.5-35.7)	1.11 (0.89-1.39)	0.34	40.9 (39.6-42.1)*	1.04 (0.94-1.15)	0.45
Teen had a preventive care visit at age 11 or 12 years												
Yes visit	40.2 (39.3-41.0)	ref		34.7 (31.5-38.0)	ref		33.2 (31.3-35.2)	ref		41.1 (40.2-42.1)*	ref	
No visit	28.5 (26.2-30.9)†	0.89 (0.82-0.96)	0.00	19.3 (14.7-25.0)†	0.73 (0.56-0.95)	0.01	22.0 (18.1-26.6)†	0.96 (0.80-1.15)	0.66	29.7 (27.1-32.5)†	0.89 (0.82-0.96)	0.00
Income to poverty ratio												
<133%	42.1 (40.3-43.9)	1.00 (0.92-1.08)	0.96	37.9 (32.7-43.3)	0.89 (0.67-1.18)	0.43	34.2 (30.3-38.2)	1.03 (0.84-1.25)	0.78	43.2 (41.2-45.3)	1.00 (0.92-1.09)	0.99
133% - <322%	32.8 (31.4-34.1)†	0.83 (0.79-0.88)	0.00	23.0 (18.9-27.6)†	0.75 (0.59-0.96)	0.03	26.8 (24.0-29.8)†	0.87 (0.75-1.01)	0.08	33.9 (32.4-35.4)*†	0.83 (0.78-0.89)	0.00
322% - <503%	37.1 (35.5-38.6)†	0.92 (0.87-0.97)	0.00	30.0 (25.0-35.5)	0.84 (0.68-1.05)	0.13	30.7 (27.4-34.3)†	0.90 (0.78-1.04)	0.14	38.1 (36.3-39.8)*†	0.93 (0.87-0.98)	0.01
>503%	42.9 (41.2-44.6)	ref		35.3 (29.4-41.6)	ref		38.4 (34.5-42.5)	ref		43.5 (41.6-45.3)*	ref	
Vaccination payment source												
Private Only	37.0 (36.0-38.0)	ref		25.7 (22.3-29.3)	ref		31.1 (28.9-33.3)*	ref		38.0 (36.9-39.1)*	ref	
Medicaid / CHIPS	43.8 (42.2-45.5)†	1.17 (1.10-1.24)	0.00	39.6 (34.9-44.5)†	1.51 (1.18-1.94)	0.00	35.4 (31.8-39.1)	1.20 (1.02-1.41)	0.03	45.1 (43.2-47.0)*†	1.16 (1.08-1.24)	0.00
Uninsured	24.4 (21.5-27.6)†	0.87 (0.76-0.99)	0.03	18.1 (10.9-28.5)	0.98 (0.62-1.54)	0.93	14.7 (9.5-22.0)†	0.82 (0.56-1.21)	0.29	25.3 (22.1-28.8)†	0.86 (0.74-0.99)	0.03
Military	37.3 (31.9-43.0)	1.01 (0.89-1.16)	0.83	25.9 (11.7-48.2)	1.23 (0.62-2.43)	0.58	26.2 (16.6-38.8)	1.03 (0.73-1.44)	0.89	38.8 (32.9-45.1)	1.01 (0.87-1.16)	0.93
Other / IHS / AIAN(All)	37.3 (33.9-40.8)	1.00 (0.91-1.11)	0.97	26.8 (17.4-38.8)	0.76 (0.48-1.20)	0.22	31.2 (23.9-39.6)	1.01 (0.80-1.27)	0.95	38.2 (34.5-42.1)	1.00 (0.90-1.11)	0.98
Received provider recommendation for HPV vaccination												
Yes	51.2 (50.1-52.3)	ref		47.4 (43.2-51.7)	ref		46.1 (43.5-48.8)	ref		51.8 (50.6-53.0)	ref	
No	21.7 (20.6-22.9)†	0.46 (0.44-0.49)	0.00	18.0 (14.9-21.7)†	0.45 (0.37-0.55)	0.00	15.0 (13.1-17.1)†	0.36 (0.31-0.42)	0.00	22.7 (21.5-24.1)*†	0.48 (0.45-0.50)	0.00
Do you know about HPV Vaccine		NA			NA			NA			NA	
Yes	38.7 (37.8-39.7)			30.8 (27.8-34.1)			32.3 (30.2-34.4)			39.8 (38.7-40.8)*		
No	22.3 (19.0-25.9)†			24.8 (16.2-36.0)			14.9 (10.1-21.4)†			23.0 (19.3-27.2)†		

Table 3. Unadjusted and Adjusted (Multivariate) logistic regression analysis for 2+ HPV vaccination coverage estimates among adolescent females aged 13-17 years by age at interview for selected sociodemographic characteristics, National Immunization Survey-Teen, United States, 2008 - 2012

Sociodemographic Characteristics	United States			Delta Regional Authority States (DRA)						Rest of US		
				DRA Counties			Non-DRA Counties					
	Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value
Have you heard about HPV vaccine		NA			NA			NA			NA	
Yes	38.5 (37.5-39.5)			31.0 (27.7-34.5)			32.2 (30.1-34.4)			39.5 (38.4-40.5)		
No	30.5 (27.9-33.3)†			26.1 (20.3-32.8)			23.2 (18.9-28.2)†			31.6 (28.7-34.8)†		
Number of Total Providers												
1	39.4 (38.2-40.5)	ref		32.2 (28.2-36.5)	ref		31.6 (29.1-34.3)	ref		40.4 (39.2-41.7)*	ref	
2 - 3	36.9 (35.4-38.4)†	0.90 (0.86-0.95)	0.00	29.5 (25.2-34.2)	0.87 (0.71-1.05)	0.15	31.9 (28.8-35.2)	1.00 (0.88-1.13)	0.97	37.8 (36.2-39.5)*†	0.89 (0.85-0.94)	0.00
4 or more	38.1 (36.2-40.1)	0.86 (0.80-0.92)	0.00	34.5 (28.0-41.5)	0.85 (0.66-1.09)	0.20	31.7 (27.6-36.1)	0.88 (0.74-1.04)	0.12	39.0 (36.8-41.2)	0.86 (0.80-0.92)	0.00
Physician contacts within past year												
None	26.9 (25.1-28.9)†	0.73 (0.67-0.79)	0.00	23.4 (17.5-30.5)†	0.87 (0.66-1.15)	0.32	22.1 (18.1-26.7)†	0.73 (0.59-0.90)	0.00	27.6 (25.5-29.7)†	0.72 (0.66-0.78)	0.00
1	35.1 (33.6-36.7)†	0.81 (0.77-0.86)	0.00	31.5 (26.1-37.6)	0.99 (0.79-1.24)	0.95	28.7 (25.5-32.2)†	0.93 (0.81-1.08)	0.33	36.0 (34.3-37.7)†	0.80 (0.75-0.85)	0.00
2 - 3	41.0 (39.6-42.4)†	0.91 (0.86-0.95)	0.00	30.8 (26.4-35.7)	0.85 (0.70-1.03)	0.09	34.6 (31.5-37.8)	0.98 (0.86-1.12)	0.80	42.1 (40.5-43.7)*†	0.90 (0.85-0.95)	0.00
4 or more	46.6 (44.9-48.3)	ref		38.1 (32.4-44.2)	ref		36.4 (32.7-40.2)	ref		48.3 (46.3-50.2)*	ref	
Facility Type												
Private	40.8 (39.7-41.9)	ref		39.2 (34.3-44.4)	ref		36.2 (33.5-38.9)	ref		41.2 (40.0-42.5)	ref	
Public	27.5 (25.7-29.3)†	0.76 (0.70-0.81)	0.00	19.4 (15.6-23.8)†	0.68 (0.53-0.87)	0.00	19.4 (16.3-22.9)†	0.66 (0.55-0.79)	0.00	29.5 (27.4-31.6)*†	0.78 (0.72-0.85)	0.00
Hospital	44.0 (41.1-46.9)†	1.05 (0.98-1.13)	0.17	40.8 (30.1-52.4)	1.16 (0.88-1.54)	0.30	40.9 (33.3-49.0)	1.14 (0.96-1.35)	0.15	44.4 (41.3-47.6)	1.04 (0.97-1.13)	0.28
Mixed	41.1 (39.1-43.1)	1.03 (0.97-1.10)	0.27	39.9 (34.0-46.2)	1.17 (0.93-1.46)	0.18	33.4 (29.6-37.5)	0.96 (0.82-1.12)	0.63	42.2 (40.0-44.4)	1.04 (0.98-1.11)	0.21
Other	32.4 (28.2-37.0)†	0.88 (0.78-1.00)	0.03	18.1 (8.1-35.6)†	0.51 (0.19-1.40)	0.14	23.8 (16.5-33.1)†	0.73 (0.51-1.04)	0.06	33.7 (28.9-38.8)*†	0.91 (0.80-1.03)	0.12
MSA												
Urban area	40.4 (39.1-41.8)†	1.04 (0.99-1.10)	0.14	36.7 (30.8-43.1)†	1.10 (0.88-1.38)	0.38	35.8 (32.8-39.0)†	1.02 (0.87-1.19)	0.83	41.0 (39.5-42.5)†	1.03 (0.97-1.09)	0.34
Suburban area	38.7 (37.4-39.9)†	1.02 (0.96-1.07)	0.53	34.9 (30.1-40.0)†	1.19 (0.98-1.43)	0.07	30.8 (28.1-33.6)	0.92 (0.79-1.06)	0.26	39.7 (38.3-41.1)†	1.01 (0.96-1.08)	0.63
Rural area	32.7 (31.2-34.2)	ref		26.9 (23.1-31.0)	ref		27.4 (23.9-31.2)	ref		34.2 (32.5-36.0)*	ref	

* p-value < 0.05 compared with DRA Counties; † p-value < 0.05 compared with reference level; NA= Not Applicable

Table 4. Unadjusted and Adjusted (Multivariate) logistic regression analysis for 3+ HPV vaccination coverage estimates among adolescent females aged 13-17 years by age at interview for selected sociodemographic characteristics, National Immunization Survey-Teen, United States, 2008 - 2012

Sociodemographic Characteristics	United States Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	DRA Counties Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Non-DRA Counties Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Rest of US Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value
Total	28.9 (28.2-29.7)*			22.5 (20.1-25.0)			24.0 (22.4-25.7)			29.7 (28.9-30.6)*		
Year												
2008	17.9 (16.3-19.6)†	0.60 (0.55-0.66)	0.00	9.5 (6.8-13.2)†	0.46 (0.30-0.69)	0.00	13.5 (10.8-16.7)†	0.62 (0.49-0.80)	0.00	18.7 (16.9-20.6)*†	0.60 (0.54-0.67)	0.00
2009	26.7 (25.2-28.3)†	0.85 (0.79-0.92)	0.00	20.2 (15.3-26.4)	0.71 (0.50-1.01)	0.06	22.2 (19.0-25.7)	0.91 (0.74-1.12)	0.38	27.5 (25.8-29.2)*†	0.85 (0.78-0.92)	0.00
2010	32.0 (30.4-33.6)	1.04 (0.96-1.12)	0.33	27.1 (22.1-32.7)	1.10 (0.83-1.47)	0.50	26.6 (23.4-30.2)	1.13 (0.94-1.35)	0.20	32.8 (31.0-34.7)	1.03 (0.95-1.11)	0.51
2011	34.8 (33.2-36.5)	1.08 (1.00-1.15)	0.04	27.7 (22.1-34.2)	1.01 (0.74-1.38)	0.94	30.8 (26.6-35.2)	1.18 (0.98-1.43)	0.08	35.5 (33.8-37.3)*	1.07 (0.99-1.15)	0.09
2012	33.5 (31.7-35.2)	ref		28.2 (22.2-35.1)	ref		27.1 (23.3-31.2)	ref		34.4 (32.5-36.4)	ref	
Age of Teen (years)												
13	20.1 (18.8-21.5)†	0.58 (0.53-0.63)	0.00	18.6 (14.2-24.1)	0.72 (0.49-1.05)	0.09	16.5 (13.7-19.7)†	0.59 (0.47-0.75)	0.00	20.6 (19.1-22.1)†	0.57 (0.52-0.63)	0.00
14	25.6 (24.1-27.2)†	0.74 (0.69-0.80)	0.00	17.1 (13.0-22.1)	0.69 (0.49-0.98)	0.04	22.4 (18.9-26.4)†	0.76 (0.62-0.93)	0.01	26.2 (24.6-28.0)*†	0.74 (0.68-0.81)	0.00
15	29.8 (28.1-31.4)†	0.83 (0.78-0.90)	0.00	29.7 (24.1-36.0)	1.14 (0.85-1.53)	0.37	24.2 (20.9-27.8)	0.86 (0.72-1.04)	0.13	30.4 (28.6-32.3)†	0.83 (0.76-0.89)	0.00
16	33.7 (32.0-35.4)	0.95 (0.89-1.02)	0.16	22.9 (18.0-28.7)	1.00 (0.72-1.37)	0.98	28.6 (24.8-32.7)	0.99 (0.83-1.18)	0.91	34.7 (32.8-36.6)*	0.95 (0.88-1.02)	0.16
17	35.4 (33.5-37.4)	ref		24.9 (19.1-31.7)	ref		28.6 (24.6-32.9)	ref		36.6 (34.5-38.8)*	ref	
Race / ethnicity												
White, non-Hispanic	29.4 (28.6-30.2)	ref		22.6 (19.8-25.8)	ref		24.4 (22.6-26.3)	ref		30.3 (29.3-31.2)*	ref	
Black, non-Hispanic	25.6 (23.5-27.9)†	0.88 (0.80-0.97)	0.01	21.6 (17.6-26.2)	0.92 (0.69-1.22)	0.57	21.0 (17.0-25.8)	0.85 (0.67-1.08)	0.18	26.8 (24.2-29.5)†	0.88 (0.79-0.98)	0.01
Hispanic	29.7 (27.7-31.8)	1.10 (1.02-1.19)	0.02	28.6 (16.5-44.8)	1.07 (0.64-1.81)	0.79	27.1 (21.0-34.3)	1.07 (0.84-1.37)	0.59	29.9 (27.7-32.1)	1.09 (1.00-1.18)	0.05
Other	29.9 (27.1-32.8)	1.05 (0.95-1.16)	0.33	23.6 (14.0-37.1)	0.98 (0.58-1.65)	0.93	21.7 (16.3-28.4)	0.82 (0.62-1.11)	0.18	30.6 (27.6-33.8)	1.06 (0.95-1.17)	0.29
Mother's Education												
<High school	28.0 (25.8-30.4)	ref		20.7 (14.8-28.2)	ref		23.4 (18.5-29.2)	ref		28.8 (26.3-31.4)*	ref	
High school graduates	26.3 (24.7-27.9)	0.85 (0.77-0.94)	0.00	22.8 (18.5-27.7)	0.95 (0.64-1.42)	0.82	20.9 (17.9-24.3)	0.77 (0.59-0.99)	0.04	27.1 (25.4-29.0)	0.86 (0.77-0.96)	0.01
> High school graduate, some college	28.1 (26.8-29.4)	0.89 (0.81-0.97)	0.01	21.8 (17.3-27.1)	0.95 (0.64-1.41)	0.79	23.5 (20.6-26.6)	0.87 (0.68-1.10)	0.26	28.9 (27.4-30.4)*	0.89 (0.80-0.98)	0.02
College graduate	32.0 (30.8-33.1)†	0.91 (0.83-1.01)	0.08	23.7 (20.0-27.8)	0.97 (0.65-1.45)	0.87	27.3 (24.6-30.1)	0.89 (0.68-1.15)	0.37	32.7 (31.5-34.0)*†	0.92 (0.82-1.02)	0.11
Mother's marital status												
Married	28.8 (27.9-29.6)	ref		21.1 (18.5-23.9)	ref		23.9 (22.1-25.7)	ref		29.6 (28.6-30.5)*	ref	
Divorced / Widowed / Separated	28.9 (27.3-30.7)	0.97 (0.91-1.04)	0.44	22.2 (17.7-27.6)	1.09 (0.82-1.46)	0.56	24.1 (20.3-28.3)	0.99 (0.82-1.19)	0.90	29.9 (28.0-31.8)*	0.98 (0.91-1.05)	0.52
Never Married	29.3 (26.7-32.1)	1.00 (0.90-1.12)	0.94	28.1 (20.6-37.1)	1.31 (0.92-1.88)	0.15	25.8 (19.5-33.4)	1.26 (0.97-1.64)	0.09	29.8 (26.8-32.9)	0.97 (0.86-1.10)	0.66

40

Table 4. Unadjusted and Adjusted (Multivariate) logistic regression analysis for 3+ HPV vaccination coverage estimates among adolescent females aged 13-17 years by age at interview for selected sociodemographic characteristics, National Immunization Survey-Teen, United States, 2008 - 2012

Sociodemographic Characteristics	United States Weighted Proportion (Unadjusted) % (95% C.I.)	United States Adjusted Prevalence Ratio (APR) % (95% C.I.)	United States P-value	DRA Counties Weighted Proportion (Unadjusted) % (95% C.I.)	DRA Counties Adjusted Prevalence Ratio (APR) % (95% C.I.)	DRA Counties P-value	Non-DRA Counties Weighted Proportion (Unadjusted) % (95% C.I.)	Non-DRA Counties Adjusted Prevalence Ratio (APR) % (95% C.I.)	Non-DRA Counties P-value	Rest of US Weighted Proportion (Unadjusted) % (95% C.I.)	Rest of US Adjusted Prevalence Ratio (APR) % (95% C.I.)	Rest of US P-value
Mother's Age (years)												
≤34 years	25.1 (22.5-27.8)	ref		23.9 (17.6-31.6)	ref		17.4 (12.9-23.2)	ref		26.3 (23.4-29.5)	ref	
35–44 years	27.7 (26.5-28.8)	1.08 (0.97-1.21)	0.16	20.6 (17.4-24.3)	0.81 (0.57-1.14)	0.24	23.5 (21.1-26.0)†	1.38 (1.02-1.86)	0.03	28.5 (27.2-29.8)*	1.07 (0.94-1.20)	0.30
≥45 years	31.0 (30.0-32.0)†	1.09 (0.97-1.22)	0.13	24.3 (20.7-28.4)	0.97 (0.68-1.39)	0.89	26.4 (24.1-28.9)†	1.44 (1.05-1.96)	0.02	31.7 (30.5-32.8)*†	1.06 (0.94-1.20)	0.34
Teen had a preventive care visit at age 11 or 12 years												
Yes visit	30.6 (29.8-31.4)	ref		24.5 (21.8-27.4)	ref		25.5 (23.8-27.4)	ref		31.4 (30.5-32.3)*	ref	
No visit	19.2 (17.3-21.3)†	0.80 (0.73-0.88)	0.00	14.6 (10.5-19.8)	0.80 (0.58-1.09)	0.15	13.6 (10.5-17.5)†	0.81 (0.63-1.03)	0.08	20.1 (17.9-22.5)*†	0.80 (0.72-0.89)	0.00
Income to poverty ratio												
<133%	29.3 (27.7-31.0)†	0.95 (0.87-1.05)	0.33	24.6 (20.3-29.6)	0.74 (0.51-1.06)	0.11	23.9 (20.5-27.7)†	1.05 (0.82-1.34)	0.70	30.2 (28.4-32.0)*†	0.95 (0.86-1.06)	0.37
133% - <322%	24.9 (23.7-26.2)†	0.83 (0.77-0.89)	0.00	17.2 (13.7-21.3)†	0.76 (0.56-1.02)	0.07	20.4 (17.9-23.1)†	0.90 (0.75-1.09)	0.28	25.8 (24.5-27.2)*†	0.83 (0.77-0.89)	0.00
322% - <503%	29.1 (27.7-30.6)†	0.91 (0.85-0.98)	0.01	25.0 (20.3-30.4)	0.96 (0.73-1.25)	0.74	24.5 (21.5-27.8)†	0.93 (0.78-1.10)	0.39	29.8 (28.2-31.5)†	0.91 (0.85-0.98)	0.01
>503%	34.1 (32.6-35.7)	ref		25.7 (20.9-31.3)	ref		30.3 (26.7-34.2)	ref		34.7 (33.0-36.4)*	ref	
Vaccination payment source												
Private Only	29.1 (28.2-30.0)	ref		19.3 (16.5-22.5)	ref		24.4 (22.4-26.5)*	ref		29.9 (28.9-30.9)*	ref	
Medicaid / CHIPS	31.4 (29.9-32.9)†	1.16 (1.08-1.25)	0.00	27.5 (23.4-32.0)†	1.64 (1.21-2.22)	0.00	25.1 (22.0-28.5)	1.18 (0.98-1.42)	0.09	32.4 (30.7-34.2)*†	1.15 (1.06-1.25)	0.00
Uninsured	16.5 (14.1-19.3)†	0.80 (0.68-0.95)	0.01	10.7 (5.4-20.2)	1.00 (0.55-1.81)	1.00	8.9 (5.0-15.5)†	0.76 (0.46-1.26)	0.26	17.2 (14.6-20.3)†	0.79 (0.66-0.95)	0.01
Military	27.8 (22.8-33.5)	0.94 (0.79-1.12)	0.52	21.9 (8.9-44.7)	1.32 (0.57-3.04)	0.54	15.9 (8.7-27.2)	0.85 (0.55-1.33)	0.47	29.2 (23.7-35.5)	0.94 (0.78-1.13)	0.52
Other / IHS / AIAN(All)	27.7 (24.8-30.9)	0.98 (0.87-1.10)	0.75	17.5 (10.3-28.2)	0.64 (0.35-1.16)	0.12	28.3 (21.1-36.7)	1.23 (0.95-1.60)	0.13	27.9 (24.7-31.5)*	0.96 (0.84-1.09)	0.50
Received provider recommendation for HPV vaccination												
Yes	39.2 (38.2-40.3)	ref		34.0 (30.1-38.1)	ref		35.5 (33.0-38.1)	ref		39.8 (38.6-40.9)*	ref	
No	15.6 (14.7-16.6)†	0.46 (0.43-0.49)	0.00	12.5 (10.0-15.6)†	0.46 (0.36-0.59)	0.00	10.8 (9.2-12.6)†	0.35 (0.29-0.42)	0.00	16.4 (15.3-17.5)*†	0.47 (0.44-0.51)	0.00
Do you know about HPV Vaccine		NA			NA			NA			NA	
Yes	29.3 (28.4-30.1)			21.8 (19.1-24.6)			24.7 (22.8-26.7)			30.1 (29.1-31.0)*		
No	14.4 (11.8-17.4)†			16.2 (9.8-25.6)			8.3 (5.3-13.0)†			15.0 (12.1-18.4)†		

Table 4. Unadjusted and Adjusted (Multivariate) logistic regression analysis for 3+ HPV vaccination coverage estimates among adolescent females aged 13-17 years by age at interview for selected sociodemographic characteristics, National Immunization Survey-Teen, United States, 2008 - 2012

Sociodemographic Characteristics	United States			Delta Regional Authority States (DRA)						Rest of US		
				DRA Counties			Non-DRA Counties					
	Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value
Have you heard about HPV vaccine		NA			NA			NA			NA	
Yes	29.3 (28.4-30.1)			22.0 (19.1-25.1)			24.7 (22.7-26.8)			30.0 (29.1-31.0)		
No	20.9 (18.6-23.5)†			18.6 (13.8-24.5)			17.1 (13.4-21.7)†			21.5 (18.9-24.4)†		
Number of Total Providers												
1	29.9 (28.9-30.9)	ref		22.6 (19.2-26.5)	ref		24.7 (22.4-27.1)	ref		30.7 (29.5-31.8)*	ref	
2 - 3	27.7 (26.4-29.1)†	0.88 (0.83-0.94)	0.00	20.7 (17.1-24.8)	0.93 (0.72-1.20)	0.58	22.7 (19.9-25.7)	0.89 (0.76-1.04)	0.14	28.7 (27.2-30.3)*†	0.88 (0.83-0.94)	0.00
4 or more	28.1 (26.4-29.9)	0.83 (0.77-0.91)	0.00	26.0 (20.2-32.6)	0.99 (0.73-1.35)	0.95	24.3 (20.7-28.3)	0.86 (0.71-1.05)	0.14	28.6 (26.7-30.6)	0.83 (0.76-0.91)	0.00
Physician contacts within past year												
None	21.1 (19.4-22.9)†	0.74 (0.68-0.81)	0.00	17.5 (12.4-24.1)†	0.92 (0.65-1.30)	0.63	15.4 (12.2-19.2)†	0.67 (0.52-0.87)	0.00	21.8 (19.9-23.8)†	0.74 (0.67-0.81)	0.00
1	25.9 (24.6-27.3)†	0.75 (0.70-0.80)	0.00	21.7 (17.2-27.0)	0.97 (0.73-1.29)	0.85	21.1 (18.2-24.3)†	0.85 (0.71-1.01)	0.06	26.5 (25.1-28.1)†	0.73 (0.68-0.79)	0.00
2 - 3	29.9 (28.6-31.2)†	0.83 (0.78-0.88)	0.00	21.8 (18.1-26.1)	0.84 (0.65-1.09)	0.19	26.1 (23.3-29.2)	0.92 (0.78-1.07)	0.28	30.6 (29.2-32.1)*†	0.81 (0.76-0.87)	0.00
4 or more	37.2 (35.6-38.9)	ref		27.1 (22.1-32.7)	ref		29.2 (25.8-32.8)	ref		38.7 (36.9-40.6)*	ref	
Facility Type												
Private	31.3 (30.3-32.4)	ref		30.9 (26.4-35.7)	ref		28.5 (26.1-31.1)	ref		31.6 (30.5-32.7)	ref	
Public	19.0 (17.5-20.6)†	0.71 (0.65-0.78)	0.00	12.5 (9.5-16.2)†	0.52 (0.38-0.72)	0.00	12.0 (9.4-15.1)†	0.55 (0.43-0.70)	0.00	20.7 (18.9-22.6)*†	0.75 (0.68-0.83)	0.00
Hospital	32.9 (30.2-35.7)	1.04 (0.95-1.14)	0.39	24.7 (16.8-34.7)	0.92 (0.63-1.34)	0.65	33.8 (26.5-42.0)	1.20 (0.97-1.47)	0.10	33.0 (30.1-36.1)	1.03 (0.93-1.13)	0.57
Mixed	30.9 (29.1-32.8)	1.02 (0.94-1.09)	0.69	27.2 (22.0-33.2)	0.91 (0.69-1.21)	0.51	24.7 (21.5-28.3)	0.95 (0.78-1.15)	0.58	31.9 (29.9-34.1)	1.03 (0.95-1.12)	0.48
Other	23.9 (20.1-28.1)†	0.89 (0.76-1.04)	0.13	13.8 (5.3-31.4)†	0.55 (0.19-1.58)	0.23	16.0 (10.1-24.4)†	0.64 (0.41-1.00)	0.04	24.9 (20.8-29.6)†	0.92 (0.79-1.09)	0.33
MSA												
Urban area	30.0 (28.8-31.3)†	1.03 (0.97-1.11)	0.34	21.7 (17.4-26.7)	0.83 (0.61-1.13)	0.23	27.4 (24.5-30.5)*†	1.13 (0.93-1.38)	0.21	30.5 (29.1-31.9)*†	1.01 (0.94-1.09)	0.77
Suburban area	29.5 (28.4-30.6)†	1.00 (0.94-1.07)	0.98	27.7 (23.5-32.4)†	1.14 (0.91-1.44)	0.25	24.2 (21.8-26.8)†	1.06 (0.87-1.28)	0.57	30.2 (28.9-31.4)†	0.98 (0.91-1.05)	0.58
Rural area	24.6 (23.3-26.0)	ref		19.9 (16.4-23.9)	ref		17.9 (15.2-20.9)	ref		26.3 (24.7-27.9)*	ref	

* p-value < 0.05 compared with DRA Counties; † p-value < 0.05 compared with reference level; NA= Not Applicable

Table 5. Unadjusted and Adjusted (Multivariate) logistic regression analysis for 3 dose series completion of HPV vaccination coverage estimates among adolescent females aged 13-17 years by age at interview for selected sociodemographic characteristics, National Immunization Survey-Teen, United States, 2008 - 2012

Sociodemographic Characteristics	United States Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	DRA Counties Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Non-DRA Counties Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Rest of US Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value
Total	67.4 (66.1-68.6)			60.9 (55.8-65.8)			66.9 (63.7-70.0)			67.6 (66.2-69.0)*		
Year												
2008	59.6 (55.5-63.5)†	0.84 (0.78-0.90)	0.00	43.2 (30.4-57.0)†	0.64 (0.44-0.91)	0.01	58.5 (49.5-67.0)	0.94 (0.79-1.12)	0.51	60.1 (55.6-64.3)*†	0.83 (0.77-0.90)	0.00
2009	67.5 (64.4-70.5)	0.98 (0.93-1.04)	0.51	58.2 (46.0-69.6)	0.86 (0.66-1.11)	0.23	69.5 (62.9-75.3)	1.08 (0.94-1.25)	0.26	67.6 (64.2-70.9)	0.98 (0.92-1.04)	0.43
2010	69.6 (66.8-72.2)	1.04 (0.98-1.09)	0.20	68.6 (58.9-77.0)	1.08 (0.88-1.31)	0.46	73.4 (67.4-78.6)†	1.15 (1.02-1.31)	0.02	69.3 (66.2-72.2)	1.02 (0.97-1.08)	0.45
2011	70.7 (68.4-73.0)†	1.05 (1.00-1.10)	0.04	63.0 (51.6-73.0)	0.96 (0.77-1.20)	0.73	69.4 (62.6-75.5)	1.12 (0.99-1.27)	0.07	71.1 (68.5-73.5)	1.05 (0.99-1.10)	0.09
2012	66.7 (64.0-69.3)	ref		62.7 (52.0-72.3)	ref		62.0 (54.3-69.1)	ref		67.3 (64.4-70.1)	ref	
Age of Teen (years)												
13	58.0 (54.9-61.2)†	0.84 (0.78-0.89)	0.00	56.4 (44.9-67.2)	0.90 (0.70-1.15)	0.39	56.9 (48.9-64.5)†	0.81 (0.70-0.93)	0.00	58.2 (54.7-61.6)†	0.84 (0.78-0.90)	0.00
14	67.1 (64.1-69.9)†	0.97 (0.92-1.02)	0.25	52.8 (41.6-63.7)	0.79 (0.61-1.03)	0.08	70.0 (61.9-76.9)*	1.00 (0.88-1.13)	0.96	67.3 (64.0-70.3)*†	0.97 (0.92-1.03)	0.34
15	65.1 (62.2-67.9)†	0.92 (0.87-0.97)	0.00	64.0 (52.4-74.2)	0.93 (0.74-1.16)	0.51	63.6 (57.0-69.8)†	0.88 (0.78-1.00)	0.06	65.3 (62.1-68.4)†	0.92 (0.87-0.98)	0.01
16	71.7 (68.9-74.2)	0.99 (0.94-1.04)	0.77	62.2 (50.7-72.5)	0.94 (0.75-1.18)	0.61	68.7 (61.6-75.0)	0.93 (0.83-1.04)	0.20	72.2 (69.2-75.0)	1.00 (0.95-1.06)	0.98
17	72.3 (69.5-74.9)	ref		68.0 (56.4-77.7)	ref		74.8 (67.7-80.7)	ref		72.2 (69.2-75.1)	ref	
Race / ethnicity												
White, non-Hispanic	72.8 (71.4-74.2)	ref		66.7 (59.9-72.9)	ref		71.3 (67.7-74.6)	ref		73.2 (71.6-74.7)	ref	
Black, non-Hispanic	60.1 (56.4-63.7)†	0.90 (0.84-0.96)	0.00	54.7 (46.2-62.9)†	0.95 (0.78-1.15)	0.57	56.2 (47.2-64.7)†	0.93 (0.80-1.08)	0.31	61.1 (56.8-65.3)†	0.89 (0.83-0.96)	0.00
Hispanic	59.6 (56.2-62.9)†	0.94 (0.89-0.99)	0.03	NA	NA	NA	63.2 (52.3-72.8)	0.96 (0.83-1.12)	0.61	59.4 (55.9-62.9)†	0.94 (0.89-0.99)	0.03
Other	65.5 (60.6-70.1)†	0.96 (0.89-1.03)	0.25	NA	NA	NA	61.6 (45.6-75.4)	0.84 (0.64-1.11)	0.16	65.8 (60.6-70.7)†	0.96 (0.89-1.04)	0.32
Mother's Education												
<High school	56.4 (52.5-60.2)	ref		48.4 (35.3-61.7)	ref		63.4 (53.1-72.6)	ref		56.1 (51.9-60.3)	ref	
High school graduates	62.8 (59.9-65.7)†	0.99 (0.93-1.07)	0.86	59.8 (50.2-68.6)	1.03 (0.78-1.37)	0.83	57.5 (50.6-64.2)	0.84 (0.73-0.97)	0.02	63.5 (60.2-66.8)†	1.01 (0.94-1.09)	0.81
> High school graduate, some college	68.2 (65.9-70.3)†	1.04 (0.98-1.12)	0.21	66.1 (55.7-75.1)†	1.20 (0.90-1.60)	0.20	69.3 (63.4-74.6)	0.97 (0.85-1.10)	0.60	68.1 (65.6-70.5)†	1.05 (0.97-1.12)	0.23
College graduate	75.5 (73.8-77.2)†	1.07 (1.00-1.15)	0.05	65.5 (57.2-72.9)†	1.08 (0.79-1.49)	0.62	74.4 (69.7-78.6)	0.93 (0.81-1.08)	0.35	75.9 (74.0-77.6)*†	1.08 (1.00-1.17)	0.03
Mother's marital status												
Married	70.0 (68.5-71.4)	ref		64.3 (58.1-70.1)	ref		68.8 (65.0-72.4)	ref		70.2 (68.6-71.8)	ref	
Divorced / Widowed / Separated	64.3 (61.3-67.2)†	0.95 (0.90-1.00)	0.04	57.3 (47.1-67.0)	0.97 (0.79-1.19)	0.78	65.2 (57.5-72.1)	1.02 (0.91-1.14)	0.77	64.5 (61.1-67.7)†	0.94 (0.89-1.00)	0.04
Never Married	56.6 (52.2-60.9)†	0.93 (0.87-1.00)	0.05	58.6 (44.8-71.1)	1.10 (0.86-1.39)	0.46	59.0 (47.8-69.3)	1.01 (0.86-1.18)	0.90	56.3 (51.4-61.1)†	0.92 (0.85-0.99)	0.02

43

Table 5. Unadjusted and Adjusted (Multivariate) logistic regression analysis for 3 dose series completion of HPV vaccination coverage estimates among adolescent females aged 13-17 years by age at interview for selected sociodemographic characteristics, National Immunization Survey-Teen, United States, 2008 - 2012

Sociodemographic Characteristics	United States Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	DRA Counties Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Non-DRA Counties Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Rest of US Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value
Mother's Age (years)												
≤34 years	53.9 (49.4-58.3)	ref		55.2 (41.6-68.1)	ref		44.9 (34.7-55.6)	ref		54.9 (49.8-59.8)	ref	
35–44 years	65.7 (63.6-67.7)†	1.12 (1.04-1.21)	0.00	59.4 (52.0-66.4)	1.01 (0.78-1.30)	0.94	66.5 (61.7-71.0)†	1.35 (1.10-1.66)	0.00	65.8 (63.5-68.0)†	1.10 (1.02-1.20)	0.01
≥45 years	72.1 (70.4-73.8)†	1.14 (1.05-1.23)	0.00	66.2 (58.3-73.3)	1.17 (0.90-1.51)	0.21	74.1 (69.5-78.3)†	1.40 (1.14-1.73)	0.00	72.1 (70.2-73.9)†	1.11 (1.02-1.21)	0.01
Teen had a preventive care visit at age 11 or 12 years												
Yes visit	68.4 (67.0-69.7)	ref		60.8 (55.3-66.1)	ref		69.1 (65.7-72.3)*	ref		68.5 (67.1-70.0)*	ref	
No visit	58.2 (53.5-62.7)†	0.91 (0.84-0.98)	0.00	61.8 (48.4-73.6)	1.01 (0.80-1.28)	0.92	47.2 (37.2-57.5)†	0.81 (0.69-0.96)	0.01	59.1 (54.0-64.1)†	0.92 (0.85-0.99)	0.02
Income to poverty ratio												
<133%	59.4 (56.8-62.0)†	0.95 (0.88-1.02)	0.13	55.2 (47.0-63.2)	0.67 (0.50-0.89)	0.01	58.9 (52.1-65.3)†	0.97 (0.82-1.16)	0.77	59.7 (56.8-62.5)†	0.95 (0.88-1.03)	0.19
133% - <322%	66.0 (63.5-68.4)†	0.94 (0.89-0.99)	0.02	61.3 (51.1-70.6)	0.85 (0.70-1.04)	0.14	63.7 (57.8-69.2)†	0.93 (0.82-1.06)	0.30	66.3 (63.6-69.0)†	0.94 (0.89-1.00)	0.04
322% - <503%	73.9 (71.6-76.0)	0.98 (0.94-1.03)	0.52	72.2 (62.6-80.1)	1.01 (0.85-1.20)	0.87	75.8 (70.1-80.7)	1.02 (0.90-1.16)	0.76	73.7 (71.2-76.0)	0.98 (0.93-1.03)	0.41
>503%	76.0 (73.6-78.2)	ref		68.4 (56.8-78.0)	ref		77.0 (70.5-82.5)	ref		76.1 (73.5-78.4)	ref	
Vaccination payment source												
Private Only	73.0 (71.4-74.6)	ref		64.5 (56.3-72.0)	ref		73.1 (69.3-76.5)	ref		73.2 (71.4-75.0)*	ref	
Medicaid / CHIPS	62.1 (59.7-64.4)†	1.00 (0.94-1.06)	0.95	60.2 (52.8-67.1)	1.28 (1.00-1.63)	0.05	61.2 (55.3-66.8)†	1.05 (0.92-1.19)	0.48	62.2 (59.6-64.8)†	0.99 (0.93-1.05)	0.73
Uninsured	50.7 (44.4-57.0)†	0.88 (0.78-0.98)	0.01	47.8 (26.4-70.1)	1.10 (0.72-1.68)	0.68	37.8 (21.4-57.6)†	0.82 (0.58-1.15)	0.19	51.4 (44.7-58.1)†	0.88 (0.78-0.99)	0.02
Military	64.8 (57.0-72.0)†	0.90 (0.79-1.02)	0.08	64.5 (34.1-86.4)	0.93 (0.42-2.07)	0.86	36.0 (18.1-58.8)†	0.70 (0.48-1.03)	0.03	67.9 (59.8-75.0)	0.93 (0.82-1.06)	0.25
Other / IHS / AIAN(All)	65.1 (59.4-70.4)†	0.99 (0.91-1.07)	0.71	49.2 (29.8-68.8)	0.64 (0.34-1.18)	0.10	79.5 (65.5-88.8)*	1.26 (1.10-1.44)	0.01	64.2 (58.0-69.9)†	0.96 (0.88-1.05)	0.41
Received provider recommendation for HPV vaccination												
Yes	70.7 (69.3-72.1)	ref		64.2 (58.0-70.0)	ref		71.4 (67.8-74.7)*	ref		70.8 (69.3-72.3)*	ref	
No	58.9 (55.9-61.8)†	0.90 (0.86-0.95)	0.00	54.3 (44.8-63.4)	0.93 (0.78-1.12)	0.44	55.4 (48.7-61.9)†	0.88 (0.78-0.99)	0.02	59.3 (56.1-62.5)†	0.91 (0.86-0.96)	0.00
Do you know about HPV Vaccine		NA			NA			NA			NA	
Yes	69.2 (67.7-70.5)			61.7 (55.7-67.5)			69.7 (66.3-73.0)*			69.3 (67.8-70.8)*		
No	47.2 (38.8-55.7)†			51.8 (31.3-71.7)			44.7 (28.2-62.5)†			47.1 (37.9-56.5)†		

Table 5. Unadjusted and Adjusted (Multivariate) logistic regression analysis for 3 dose series completion of HPV vaccination coverage estimates among adolescent females aged 13-17 years by age at interview for selected sociodemographic characteristics, National Immunization Survey-Teen, United States, 2008 - 2012

Sociodemographic Characteristics	United States			Delta Regional Authority States (DRA)						Rest of US		
				DRA Counties			Non-DRA Counties					
	Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value	Weighted Proportion (Unadjusted) % (95% C.I.)	Adjusted Prevalence Ratio (APR) % (95% C.I.)	P-value
Have you heard about HPV vaccine		NA			NA			NA			NA	
Yes	69.7 (68.3-71.1)			61.3 (54.8-67.5)			70.6 (67.1-73.9)*			69.9 (68.3-71.4)*		
No	56.3 (50.9-61.6)†			61.4 (47.8-73.5)			60.6 (49.8-70.4)			55.8 (49.8-61.6)†		
Number of Total Providers												
1	68.7 (66.9-70.5)	ref		58.6 (51.0-65.9)	ref		69.1 (64.6-73.4)*	ref		69.0 (67.0-70.9)*	ref	
2 - 3	67.2 (64.9-69.5)	0.96 (0.92-1.00)	0.06	60.7 (52.0-68.7)	1.12 (0.92-1.36)	0.25	65.4 (59.6-70.7)	0.93 (0.84-1.04)	0.18	67.7 (65.1-70.1)	0.96 (0.91-1.00)	0.06
4 or more	63.4 (60.2-66.5)†	0.92 (0.87-0.98)	0.01	67.7 (56.2-77.5)	1.21 (0.97-1.50)	0.10	63.7 (55.8-70.9)*	0.94 (0.84-1.07)	0.35	63.3 (59.7-66.7)*†	0.92 (0.86-0.98)	0.00
Physician contacts within past year												
None	64.2 (60.4-67.9)†	0.91 (0.85-0.96)	0.00	59.2 (44.9-72.1)	1.04 (0.81-1.34)	0.74	58.2 (47.7-68.0)†	0.82 (0.69-0.96)	0.01	64.9 (60.7-68.8)†	0.90 (0.85-0.96)	0.00
1	63.9 (61.3-66.5)†	0.84 (0.80-0.89)	0.00	60.1 (49.3-69.9)	0.96 (0.76-1.22)	0.75	61.8 (55.0-68.1)†	0.82 (0.73-0.92)	0.00	64.2 (61.4-67.0)†	0.84 (0.80-0.89)	0.00
2 - 3	66.3 (64.1-68.5)†	0.88 (0.84-0.91)	0.00	59.5 (50.5-67.9)	0.97 (0.80-1.19)	0.80	67.8 (62.4-72.7)	0.90 (0.81-0.99)	0.03	66.4 (63.9-68.8)†	0.87 (0.83-0.91)	0.00
4 or more	74.9 (72.8-76.8)	ref		63.6 (54.2-72.1)	ref		74.6 (69.0-79.5)	ref		75.3 (73.0-77.4)	ref	
Facility Type												
Private	71.1 (69.3-72.8)	ref		66.1 (57.8-73.5)	ref		73.2 (68.8-77.1)	ref		71.0 (69.1-72.8)	ref	
Public	55.2 (51.6-58.6)†	0.87 (0.81-0.92)	0.00	54.2 (43.6-64.4)	0.85 (0.67-1.07)	0.15	48.8 (40.3-57.3)†	0.74 (0.62-0.89)	0.00	55.9 (51.9-59.8)†	0.88 (0.82-0.94)	0.00
Hospital	65.8 (61.4-70.0)†	0.96 (0.89-1.02)	0.18	51.5 (35.3-67.4)	0.83 (0.62-1.11)	0.17	75.8 (64.3-84.5)*	1.06 (0.93-1.20)	0.40	65.2 (60.4-69.8)†	0.95 (0.88-1.02)	0.13
Mixed	67.0 (64.0-69.8)†	0.97 (0.92-1.02)	0.21	62.6 (52.6-71.7)	0.87 (0.69-1.09)	0.20	63.4 (56.2-69.9)†	0.95 (0.84-1.07)	0.41	67.5 (64.2-70.7)	0.98 (0.92-1.03)	0.39
Other	61.3 (53.6-68.5)†	0.95 (0.85-1.06)	0.34	NA	NA	NA	50.9 (33.4-68.2)†	0.80 (0.59-1.10)	0.10	62.5 (54.1-70.2)†	0.96 (0.86-1.08)	0.51
MSA												
Urban area	65.6 (63.6-67.6)	0.97 (0.93-1.02)	0.24	50.1 (40.4-59.8)	0.81 (0.64-1.01)	0.06	66.4 (61.3-71.1)*	1.06 (0.92-1.21)	0.40	65.9 (63.7-68.0)*	0.96 (0.91-1.01)	0.14
Suburban area	68.9 (66.9-71.0)	0.96 (0.91-1.01)	0.09	69.4 (60.6-76.9)	1.03 (0.86-1.23)	0.76	71.0 (66.0-75.5)†	1.08 (0.95-1.23)	0.22	68.7 (66.5-70.9)	0.94 (0.89-0.99)	0.03
Rural area	67.6 (65.0-70.1)	ref		62.7 (55.0-69.8)	ref		58.0 (50.1-65.5)	ref		69.3 (66.4-72.1)	ref	

* p-value < 0.05 compared with DRA Counties; † p-value < 0.05 compared with reference level; NA= Not Applicable

Table 6. Unvaccinated adolescent females aged 13-17 years by age at interview, National Immunization Survey-Teen, United States, 2008 - 2012

Unvaccinated Adolescent Females	United States Weighted Proportion % (95% C.I.)	Delta Regional Authority States (DRA)		Rest of US Weighted Proportion % (95% C.I.)
		DRA Counties Weighted Proportion % (95% C.I.)	Non-DRA Counties Weighted Proportion % (95% C.I.)	
Does teen intend to receive HPV vaccination				
Very likely	21.4 (20.4-22.4)	23.8 (20.6-27.4)	23.2 (21.1-25.5)	21.1 (20.0-22.2)
Somewhat likely	18.5 (17.6-19.4)	20.6 (17.4-24.2)	18.5 (16.7-20.5)	18.4 (17.4-19.4)
Not too likely	17.6 (16.8-18.5)	17.6 (14.9-20.7)	17.5 (15.7-19.5)	17.6 (16.7-18.7)
Not too likely at all	34.3 (33.2-35.4)	29.2 (25.8-32.9)	32.8 (30.5-35.3)	34.7 (33.5-36.0)
Not sure/Don't know	8.2 (7.5-9.0)	8.8 (6.7-11.5)	7.9 (6.4-9.7)	8.2 (7.4-9.1)
Reasons for not vaccinating with HPV				
Not Needed or Not Necessary	20.1 (18.9-21.4)	23.6 (19.1-28.8)	23.0 (20.2-26.1)	19.6 (18.3-21.1)
Safety Concern / Side Effects	14.4 (13.4-15.4)	18.2 (14.4-22.8)	13.8 (11.7-16.2)	14.3 (13.2-15.5)
Not Sexually Active	18.4 (17.3-19.5)	17.3 (13.7-21.7)	19.0 (16.3-22.0)	18.3 (17.1-19.6)
Lack of Knowledge	16.6 (15.4-17.9)	16.6 (12.7-21.3)	15.7 (13.5-18.2)	16.7 (15.3-18.2)
Not Recommended	11.7 (10.7-12.8)	12.1 (9.1-15.8)	11.5 (9.5-13.9)	11.7 (10.6-12.9)
Not Appropriate Age	6.5 (5.9-7.3)	4.5 (3.1-6.6)	7.5 (5.8-9.7)	6.5 (5.8-7.3)
Family / Parental Decision	3.9 (3.4-4.5)	4.1 (2.3-7.1)	5.0 (3.5-7.1)	3.8 (3.2-4.4)
Costs	3.1 (2.5-3.7)	3.0 (1.8-4.9)	1.7 (1.1-2.8)	3.2 (2.6-4.0)
More Info / New Vaccine	3.8 (3.3-4.4)	2.7 (1.5-4.7)	2.7 (1.9-3.9)	4.0 (3.4-4.6)
Child Should Make Decision	1.5 (1.2-2.0)	2.6 (1.3-5.3)	2.0 (1.2-3.2)	1.4 (1.0-2.0)
Other Reason	1.7 (1.4-2.2)	1.3 (0.5-3.2)	1.7 (1.0-2.9)	1.8 (1.4-2.2)

References

Berry-Cabán, C. S., & Buenaventura, J. B. (2009). HPV vaccination coverage among adolescents aged 9 to 17 years in a United States military treatment facility. *International Journal of Adolescent Medicine and Health, 21*(4), 567-570.

Brewer, N. T, Gottlieb, S. L, Reiter, P. L, Liddon, N., Markowitz, L., Smith, J. S. (2011) Longitudinal predictors of human papillomavirus vaccine initiation among adolescent girls in a high-risk geographic. *Sex Transm Dis.,14*(3):197–204. doi:10.1097/OLQ.0b013e3181f12dbf

Bynum, S. A., Staras, S. A. S., Malo, T. L., Giuliano, A. R., Shenkman, E., & Vadaparampil, S. T. (2014). Factors associated with Medicaid providers' recommendation of the HPV vaccine to low-income adolescent girls. *Journal of Adolescent Health, 54*(2), 190-196.

Centers for Disease Control and Prevention, (2007). Quadrivalent human papillomavirus vaccine: recommendations of the Advisory Committee on Immunization Practices (ACIP). *Morbidity and Mortality Weekly Report,, 56* (No. RR-2):1-19.

Centers for Disease Control and Prevention, (2011) Adding Households with Cell Phone Service to the National Immunization Survey, 2011; Retrieved from: http://www.cdc.gov/vaccines/imz-managers/coverage/nis/child/dual-frame-sampling.html

Centers for Disease Control and Prevention, (2011). National Immunization Survey-Teen: A User's Guide for the 2011 Public-Use Data File. 2012. Retrieved from: ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NIS/NISteenPUF11_DUG.pdf

Centers for Disease Control and Prevention, (2012) National and state vaccination coverage among adolescents aged 13–17 years—United States, 2011. *Morbidity and Mortality Weekly Report, 61*:671–7.

Centers for Disease Control and Prevention, (2012) National Immunization Survey-Teen. A User's Guide for the 2012 Public-Use Data File. Retrieved from: ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NIS/NISTEENPUF12_DUG.pdf Accessed May 22, 2014.

Centers for Disease Control and Prevention, (2013). Advisory Committee on Immunization Practices (ACIP) recommended immunization schedules for persons aged 0 through 18 years and adults aged 19years and older—United States, 2013, *Morbidity and Mortality Weekly Report, 62* (Suppl1):1-19.

Centers for Disease Control and Prevention, (2014) Invasive Cancer Incidence - United States, 2010, *Morbidity and Mortality Weekly Report, 63*(12):253-259.

Daley, E. M., Vamos, C. A., Buhi, E. R., Kolar, S. K., McDermott, R. J., Hernandez, N., & Fuhrmann, H. J. (2010). Influences on human papillomavirus vaccination status among female college students. *Journal of Women's Health, 19*(10), 1885-1891.

Delta Regional Authority (2013) About DRA, http://www.dra.gov/about-us/default.aspx. Accessed May 22, 2014.

Dempsey, A., Cohn, L., Dalton, V., & Ruffin, M. (2011). Worsening disparities in HPV vaccine utilization among 19–26 year old women. *Vaccine, 29*(3), 528-534. doi: http://dx.doi.org/10.1016/j.vaccine.2010.10.051

Dorell, C. G., Yankey, D., Santibanez, T. A., & Markowitz, L. E. (2011). Human Papillomavirus Vaccination Series Initiation and Completion, 2008–2009. *Pediatrics, 128*(5), 830-839. doi:10.1542/peds.2011-0950

Fisher, H., Trotter, C. L., Audrey, S., MacDonald-Wallis, K., & Hickman, M. (2013). Inequalities in the uptake of Human Papillomavirus Vaccination: a systematic review and meta-analysis. *International Journal of Epidemiology, 42*(3), 896-908.

Gelman, A., Miller, E., Schwarz, E. B., Akers, A. Y., Jeong, K., & Borrero, S. (2013). Racial disparities in human papillomavirus vaccination: does access matter? *Journal of Adolescent Health, 53*(6), 756-762.

GLOBOCAN 2012, International Agency for Research on Cancer (IARC), http://globocan.iarc.fr/Pages/fact_sheets_cancer.aspx Accessed May 30, 2014.

Gray, P. A. (1991). Economic development and African Americans in the Mississippi Delta. *Rural Sociology, 56*(2), 238-246.

Hariri, S., Markowitz, L. E., Dunne, E. F., & Unger, E. R. (2013). Population impact of HPV vaccines: summary of early evidence. *Journal of Adolescent Health, 53*(6), 679-682.

Jain, N., Singleton, J. A., Montgomery, M., Skalland, B., (2009). Determining accurate vaccination coverage rates for adolescents: the National Immunization Survey-Teen 2006. *Public Health Rep., 124*(5):642-651.

Jemal, A., Simard, E. P., Dorell, C., Noone, A. M., Markowitz, L. E., Kohler, B., . . . Edwards, B. K. (2013). Annual report to the nation on the status of cancer, 1975-2009, featuring the burden and trends in human papillomavirus (HPV)-associated cancers and HPV vaccination coverage levels. *Journal of the National Cancer Institute, 105*(3), 175-201.

Jeudin, P., Liveright, E., Carmen, M. G. d., & Perkins, R. B. (2014). Race, ethnicity, and income factors impacting human papillomavirus vaccination rates. *Clinical Therapeutics, 36*(1), 24-37.

Kadis, J. A., McRee, A. L., Gottlieb, S. L., Lee, M. R., Reiter, P. L., Dittus, P. J., & Brewer, N. T. (2011). Mothers' support for voluntary provision of HPV vaccine in schools. *Vaccine, 29*(14), 2542-2547.

Keating, K. M., Brewer, N. T., Gottlieb, S. L., Liddon, N., Ludema, C., & Smith, J. S. (2008). Potential Barriers to HPV Vaccine Provision Among Medical Practices in an Area with High Rates of Cervical Cancer. *Journal of Adolescent Health, 43*(4, Supplement), S61-S67. doi: http://dx.doi.org/10.1016/j.jadohealth.2008.06.015

Kester, L., Zimet, G., Fortenberry, J. D., Kahn, J., & Shew, M. (2013). A National Study of HPV Vaccination of Adolescent Girls: Rates, Predictors, and Reasons for Non-Vaccination. *Maternal and Child Health Journal, 17*(5), 879-885. doi: 10.1007/s10995-012-1066-z

McRee, A. L., Reiter, P. L., Chantala, K., & Brewer, N. T. (2010). Does framing human papillomavirus vaccine as preventing cancer in men increase vaccine acceptability? *Cancer Epidemiology, Biomarkers & Prevention, 19*(8), 1937-1944.

Perkins, R. B., Anderson, B. L., Gorin, S. S., & Schulkin, J. A. (2013). Challenges in cervical cancer prevention: a survey of U.S. obstetrician-gynecologists. *American Journal of Preventive Medicine, 45*(2), 175-181.

Rosenthal, S. L., Weiss, T. W., Zimet, G. D., Ma, L., Good, M. B., & Vichnin, M. D. (2011). Predictors of HPV vaccine uptake among women aged 19–26: Importance of a physician's recommendation. *Vaccine, 29*(5), 890-895. doi: http://dx.doi.org/10.1016/j.vaccine.2009.12.063

Stokley, S., Curtis, C. R., Jeyarajah, J., Harrington, T., Gee, J., & Markowitz, L. (2013). Human papillomavirus vaccination coverage among adolescent girls, 2007-2012, and postlicensure vaccine safety monitoring, 2006-2013 - United States. *Morbidity and Mortality Weekly Report, 62*(29), 591-595.

Vadaparampil, S. T., Murphy, D., Rodriguez, M., Malo, T. L., & Quinn, G. P. (2013). Qualitative responses to a national physician survey on HPV vaccination. *Vaccine, 31*(18), 2267-2272.

Wheldon, C. W., Daley, E. M., Buhi, E. R., Nyitray, A. G., & Giuliano, A. R. (2011). Health beliefs and attitudes associated with HPV vaccine intention among young gay and bisexual men in the southeastern United States. *Vaccine, 29*(45), 8060-8065.

Wong, C. A., Berkowitz, Z., Dorell, C. G., Price, R. A., Lee, J., & Saraiya, M. (2011). Human papillomavirus vaccine uptake among 9- to 17-year-old girls: National Health Interview Survey, 2008. *Cancer, 117*(24), 5612-5620.

Ylitalo, K. R., Lee, H., & Mehta, N. K. (2013). Health Care Provider Recommendation, Human Papillomavirus Vaccination, and Race/Ethnicity in the US National Immunization

Survey. *American Journal of Public Health, 103*(1), 164-169. doi: http://dx.doi.org/10.2105/AJPH.2011.300600