

Evaluation of Factors Associated with Human Papilloma Virus (HPV) Vaccine Acceptability in  
Parents of Adolescents

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## **Abstract**

This study analyzed the influence of parents' education, race and ethnicity, awareness regarding Human Papilloma Virus (HPV) and provider recommendation on the acceptability of HPV vaccine for their children. All these factors did play a role in shaping the decision of parents regarding HPV vaccine. The Statistical Package for Social Services (SPSS) was utilized to analyze the 2007 California Health Interview Survey data using Chi Square statistics. The results of the study showed that the influence of education of parents and race/ethnicity was significant in HPV vaccine decisions but the influence of provider recommendation and HPV awareness was found to be minimal. These findings may be valuable for providers, health care researchers and public health professionals who are responsible for providing public health education.

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## **List of Abbreviations**

CATI	Computer Assisted Telephone Interview
CDC	Centers for Disease Control and Prevention
CHIS	California Health Interview Survey
CMS	Centers for Medicare and Medicaid Services
HHS	Department of Health and Human Services
HPV	Human Papilloma Virus
PCP	Primary Care Physician
RDD	Random Digital Dial
SPSS	Statistical Package for Social Services
STI	Sexually transmitted Infection
UCLA	University of California, Los Angeles

## **Introduction**

Human Papilloma Virus (HPV) is one of the most common sexually transmitted infections in the United States. HPV belongs to a family of viruses that cause cell changes in the epithelia resulting in benign skin lesions called warts and verrucae. The virus affects the skin and mucous membranes especially of the reproductive organs. Cervical cancer and other ano-genital cancers are seen in women with persistent genital HPV infection. HPV that affects the skin can be transmitted by skin-to-skin contact with an affected person and genital HPV is spread through kissing and oral sex (Ferrer, Trotter, Hickman & Audrey, 2014). Sometimes the virus remains latent and does not show any symptoms making it difficult to diagnose in an infected person. The influence of immunity, smoking and certain medication in causing cervical cancer should also be considered in high-risk individuals.

### **Purpose of the study**

HPV infection has now become ubiquitous among young sexually active individuals and evidence suggests that the substantial risk of acquiring it is increasing. It is important to identify barriers and come up with comprehensive vaccination programs to eliminate the disparities in vaccination uptake. There has been a steady decrease in the incidence and mortality rates from cervical cancer but there are disparities in the acceptability of the vaccine in populations depending on the race, educational background and access to primary care physician (Jeudin, Liveright, Del & Perkins, 2014). This study examined the relationship between HPV awareness and acceptability of parents of adolescent boys and girls. Acceptability is the dependent variable and awareness and knowledge of HPV were taken as independent variables for the study. The study also examines the influence of factors like race and ethnicity, safety issues and provider recommendations on the intent to vaccinate children. The study compared data to determine the

relationship between HPV acceptability and education of parents, race, ethnicity and HPV awareness. The study examined the knowledge, attitudes and practices of parents that shape their decisions in getting their children vaccinated. Previous research on HPV acceptability was focused on identifying at risk populations and implementing strategies to promote the benefits of the vaccine (Ferrer, Trotter, Hickman & Audrey, 2014). Questions regarding safety and adverse events remain unanswered for parents; hence getting approval to vaccinate their children is a daunting task.



## **Background**

### **Significance of the problem**

HPV virus is responsible for more than 70% of vulvar and vaginal cancers and 90% of cervical and anal cancers. Statistics reveal 33,200 HPV related cancers are reported in the United States each year (CDC, 2014). There is no treatment for HPV infections, as natural immunity will clear the virus from the body over time. However, there are ways to prevent the infection by preventive measures like condoms and vaccines to prevent cervical cancer in high-risk individuals. There are two HPV vaccines, mainly Gardasil® (Human Papilloma-Virus vaccine, Quadrivalent) and Cervaix® (Human Papilloma-Virus, Bivalent (types 16 and 18) vaccine, Recombinant) which provide protection against HPV infection (Ferrer, Trotter, Hickman & Audrey, 2014). Vaccines are recommended for boys and girls from the ages of 11 to 12 years as well as for teen boys and individuals with compromised immunity (CDC, 2014). According to CDC statistics in 2014, catch up vaccines are recommended for individuals who did not receive the vaccine at an early age; and it is important to get the vaccination at an early age as a preventive measure before the first sexual contact because the infection can be acquired easily even through one partner. Past studies showed the vaccine may have caused auto immune disorders, infertility, and death, but these events were ruled out as related due to lack of data (Schuler, 2013). HPV is a recombinant vaccine, which is made with virus-like proteins manufactured from yeast cells. No constituent of the virus is included in the virus, thus making a product, which is considered safe.

The utilization rate for HPV vaccines is directly influenced by parent, patient and provider attitudes towards the vaccine. Ethnic backgrounds, perceptions, safety issues about the vaccine along with lack of awareness are some of the common barriers to acceptability (Ferrer,

Trotter, Hickman & Audrey, 2014). To some extent, awareness programs will help ease the concerns of parents and help them to make an informed decision but it requires a lot of work to practically achieve the mission of saving the adolescents from HPV (Hollander, 2012). There is always a persistent gap between HPV and other vaccinations that are recommended for adolescents due to lack of awareness and concerns about vaccine safety. The difference in vaccination rates show valuable opportunities that are being missed in protecting young girls and boys, elevating HPV infection risk in them. Many women in the low-income families reported prior sexual experience and delay in vaccination placing them at high risk for HPV infections (Hofstetter et al., 2014). It is crucial to engage clinicians, parents and other stakeholders and come up with collaborative efforts to promote vaccination and eliminate barriers of any kind.

### **Race and Ethnicity**

The prevalence of HPV infection and cervical cancer rates are disproportionate among low income and minority adolescents (Reiter, McRee, Gottlieb, & Brewer, 2010). The population of Blacks, Asians and Hispanics will continue to grow in the next several decades in the United States so it is imperative that we improve vaccination rates and identify cultural barriers to eliminate them (Hollander, 2012). The low income, minority female population in the age group of 13-26 years show delayed initiation of the vaccine (Lai, Tinker & Cheung, 2013). Reducing these missed opportunities and promoting timely HPV vaccination is crucial for the protection from infections. A study was conducted in the United States with a sample of ethnically diverse group of mothers to determine the relationship between information seeking and vaccine intentions. The survey of Black, Hispanic and White parents showed that perceived benefits were associated with vaccination intentions; perceived vulnerability was associated with talking with doctors and others about the vaccine (Baldwin, Bruce & Tiro, 2013). Overall the

study showed that beliefs about HPV virus risk are dependent on seeking information from a doctor and others. However, ethnic minorities were less likely to talk with others about the vaccine and the study helped to come up with educational programs and awareness campaigns to address the challenges.

The highest incidence of cervical cancer was seen among American Indian women from the northern plains based on a study conducted in tribal communities of northern plains to assess attitudes to vaccination (Buchwald, Muller, Bell & Schmidt 2013). Questions regarding HPV knowledge were given as a survey to women and correct answers were considered the only positive factor correlated with willingness to vaccinate children. The final conclusion was that these women were less knowledgeable of HPV and its role in cervical cancer.

Similar conclusions were drawn from a study conducted in United Kingdom in 2009 using a sample of ethnic minority women and a comparative sample of British women (Marlow, Wardle, Forster & Waller, 2009). The data collected from the study showed that HPV awareness was lower among minority women than British women. South Asian women were least likely to believe that the vaccine would protect their daughters and cited the most sex-related concerns.

A different study conducted on immigrant Hispanic men showed the willingness to vaccinate as 87.5% for sons and 78.8% for daughters, but knowledge regarding the risk factors was varied and awareness was low (Kornfeld, Byrne, Vanderpool, Shin & Kobetz, 2013). The design of the study did not permit data collection on actual behaviors and it was concluded that the degree of willingness to vaccinate children might not be an accurate predictor of future behaviors.

Socio-cultural factors like communication between mother and daughter and age of first sexual contact were moderated by ethnicity (Reimer, Houlihan, Gerrard, Deer, & Lund, 2013).

The study was the first to examine the effects of beliefs, knowledge and attitudes on vaccine initiation in Latina and white women and concluded that behavioral and socio-cultural factors do not have the same effect in both cultures. These studies show that information has to be tailored to reach the ethnic minorities and recording ethnicity was crucial part of vaccine uptake data.

The influence of religious norms on HPV acceptability should be considered in developing interventions. A delicate balance is important when informing parents about virus transmission through sexual activity without promoting any risky sexual activity. According to a more recent study, Catholic parents were three times more likely to get children vaccinated compared to immigrants and Protestants (Schuler, Hanley & Coyne-Beasley, 2013). Negative beliefs were expressed between Protestant and other Christian denominations and they preferred vaccination to occur at older ages (above 19 years) in children. The study was the first one to examine the influence of religious factors and the sample surveyed a fairly representative US population. Schuler, Hanley & Coyne-Beasley suggested that, health care providers have to be culturally competent and play a central role in addressing such religious concerns.

In spite of a large number of studies that have repeatedly emphasized that the vaccine is safe and has minimal potential harm, there is suboptimal public acceptance for the vaccine. A study was conducted in 2013 to determine the impact of knowledge and socio-demographic factors on vaccine acceptability. A six point scoring system was used to evaluate personal knowledge of mothers about HPV. The willingness to vaccinate children and knowledge of HPV was higher in whites than in other races (Ratanasiripong & Chai, 2013).

Attitudes of parents towards the vaccine are mediated by relationship between behavioral beliefs and vaccination intention of parents (Bryer, 2014). Overall, all ethnic groups

realized the importance of HPV vaccination but they differed in perceiving barriers and accepting the vaccine mandate (Pierre, Belizaire, Porter, Walsh & Esang, 2014).

### **HPV Awareness**

There is abundant research and data regarding lower uptake rates of HPV vaccines. Less is known, however, about the relationship between acceptability and awareness. A study was done with a large sample of African American parents to determine vaccine acceptability, knowledge of HPV and socio-cultural attitudes that affect vaccination intention of parents for their daughters (Thompson, Arnold & Notaro, 2011). Two thirds of the parents were aware of HPV and vaccination importance but vaccination rates were significantly affected by pediatrician recommendation. Most parents were concerned about safety and Sexually Transmitted Infections (STIs). This finding revealed that there are gaps in the HPV awareness even among educated parents and that parents will require advice from a clinician to get the maximum benefits of the vaccine for their children.

Parents' consents to have their children vaccinated was higher in opt-in decision. Most of the parents had no knowledge about the HPV infections and the benefits of the vaccine against HPV (Reiter, McRee, Pepper, & Brewer, 2012). The results of the study had important public health implications. Mothers' awareness of HPV, insurance status and age are also strong predictors of vaccine initiation according to a study conducted in minority women (Tsui, 2013). Data revealed that initiation rates for the vaccine were higher in girls of disadvantaged neighborhoods although individual factors, such as parental influence, were more crucial factors for vaccination.

According to some studies, the level of knowledge about HPV was a stronger determinant of HPV acceptability than race and ethnic factors. A study conducted in immigrant

Chinese and American women concluded that English proficiency and insurance status were also important factors for vaccine acceptance (Nguyen, Chen & Chan, 2012). Data from the survey showed that HPV acceptance was extremely low owing to the women's lack of access to linguistically appropriate information regarding HPV.

Similar conclusions were drawn from a study conducted in immigrant Vietnamese and American women that was done to determine the relationship between English proficiency and HPV acceptability (Yi, Anderson, Le, Escobar-Chaves & Reyes-Gibby, 2013). The study made an important conclusion that educational materials should also be made available in languages prevalent in the community. However, the participants of the study were immigrant Vietnamese with minimal education who may not be representative of this entire population. Data regarding access to a PCP was not collected so the influence of provider recommendation was not considered.

Despite the widespread availability of vaccines for HPV infections, vulnerable and low-income populations have limited access and knowledge of vaccination benefits. A survey was conducted in Rhode Island to determine Knowledge, Attitudes and Practices (KAP) and an educational intervention via a brief video that was shown to Hispanic parents. The willingness to vaccinate children improved after video intervention, which indicated that HPV awareness is positively linked to vaccination intention (Chau et al., 2014). HPV acceptability was higher among parents who were aware of the consequences of infection through social media and Internet. Social marketing interventions were used as a means to improve the vaccination rates in a study done in North Carolina in 2014. Survey data from the study showed that marketing techniques could be an effective method to encourage health care providers and parents to vaccinate children (Cates, Diehl, Crandell & Coyne, 2014).

A study conducted in a sample of mothers to learn their attitudes towards getting their children vaccinated show that the strongest correlate was protection from future disease (Reiter, Oldach, Randle & Katz, 2014). Data from a different study done in a Hispanic population showed that out-of-pocket costs for the vaccine troubled parents and made them reconsider before vaccinating their children (Molokwu, Fernandez & Martinez, 2014). However, information regarding the socio-economic status and number of children in the family was not stated.

School health centers are an opportunity to better understand barriers to HPV delivery in schools. The lessons learned can be applied to improve school-based vaccination programs. School Health Centers also face the barrier of high out-of-pocket costs, clinic ordering, stocking costs and parental consent issues (Moss, 2014). The federal vaccine program for children provides free vaccines for children and teens that are Medicaid-eligible. Thus, being underinsured may no longer be a major concern for parents. It is a clear indication of the beneficial influence of having access to information and a positive parental attitude on HPV vaccination rates.

Another study was conducted in North Carolina in 2012 to understand the influence of Internet usage on HPV acceptability in parents (McRee, Reiter & Brewer, 2012). This was a cross-sectional survey and data were analyzed to examine vaccination intentions, attitudes and beliefs. The study concluded that Internet usage will have a positive influence in motivating parents but there were often gaps in the information regarding the adverse reactions and side effects to this vaccine.

Based on these studies, it appears that the reaction of parents to a vaccination mandate is critical in development of educational and health promotion materials that will help them make an informed decision for their children.

### **Provider Recommendation**

Lingering safety issues and adverse events for the vaccine also seem to be one of the major concerns of parents. It is important that parents understand that there will be risks involved in the process and they must be assured that the benefits exceed the risks. Fifty-six million doses of the HPV vaccine Gardasil had been administered as of April 2013 in the United States and 19,523 non-serious events and 1671 serious events had been reported to the Vaccine Adverse Event Reporting System (Scaparrotta, & Chiarelli, 2014).

According to a study done in 2014, the most common reason for non-vaccination (56.7%) was lack of provider recommendation (Donahue, Stupiansky, Alexander & Zimet, 2014). Level of acceptability was comparatively low when combinations of logistical and attitudinal barriers were seen among parents. Low income and minority parents were more likely to accept vaccination if physicians offered it and more information were provided to them that enabled them to make a decision (Perkins et al., 2013). These studies showed that lack of strict adherence to three-dose regimen and poor vaccine initiation was a major public health concern that required continuous efforts from health educators and clinicians. Improving provider communication and increasing access to low cost immunization should help enhance the vaccination rates.

Many parents were concerned about vaccinating their daughters against HPV as this might communicate approval for sexual activity and initiate risky sexual behavior. This was proven wrong by an anonymous web-based survey conducted in 2013 with a sample of



community college students. The study attempted to understand the chronology of sexual behavior and vaccination status. HPV vaccination was not associated with risky sexual behavior; many adolescents (45%) received the vaccine after first sexual activity (Marchand, Glenn & Bastani, 2013). Results of the study showed no evidence of risky sexual behavior among adolescents and it also adds to the growing body of literature that parents need not be worried about vaccination affecting behavior.

A brief survey was done on a sample of parents and providers in Texas to assess the perceptions of HPV vaccine importance, safety and efficiency and acceptability. It was shown that providers overestimate parental concerns regarding the route of administration and underestimate the importance to them in preventive health diseases (Healy, Montesinos & Middleman, 2013). Such attitudes definitely impact parental vaccine decisions and require further research. Most cited reasons for non-vaccination of girls were concerns regarding effectiveness and belief that it is not mandatory (Dorell et al., 2014).

The CDC data regarding cervical cancer and infection cases make it a public health concern now. In spite of awareness programs, one in every four parents expresses their concerns regarding safety and adverse events (Carlyle, 2013). Parents should understand that the vaccine is not about sexuality but it is a means to protection against cancer and also has a strong record of safety. It closes the door to cancer rather than opening the door to sex. According to the reports by CDC, 56 million doses of Gardasil have been distributed in the United States from June 2006 to March 2013. Twenty-one thousand, one hundred and ninety-four adverse events were reported out of which 92% were non-serious. Additionally, the numbers of adverse reactions reported have been steadily decreasing since 2009 (CDC, 2014).

## **Research Question**

Human Papilloma Virus is a sexually transmitted infection. This infection can affect any sexually active person in his or her lifetime. Survey data from Los Angeles (L.A.), California, for the year 2007 was used to address the following questions:

1. How do the demographics of adolescents who receive the vaccines compare to those who do not.
2. Did the education of parents impact the decision regarding HPV vaccination?
3. Does race play a factor for HPV vaccination acceptability?

## Methodology

The study utilized data collected from the California Health Interview Survey (CHIS) conducted in 2007, to determine the factors associated with Human Papilloma virus (HPV) acceptability by parents for their children. The CHIS is the largest state health survey in the nation and is an important source of data on Californian's health and healthcare needs. The survey was conducted by the UCLA Center for Health Policy Research in collaboration with the California Department of Health Care Services and the California Department of Public Health. It was conducted as a random-digital-dial telephone survey with questions on a wide range of healthcare topics. The survey provided county level information and statewide information on the overall population that includes all the ethnic groups. Extensive information was collected from all age groups regarding health status, insurance coverage, health-related behaviors, services provided and other health-related issues. Many agencies, organizations, researchers and policy experts use these results to assess the healthcare needs of the population and align policies according to the budget and to plan services and coverage. The information from the survey also helps in comparing healthcare outcomes and planning public health initiatives. (From *California Health Interview Survey*, 2007, June 26.)

Every year thousands of households, representing the diverse population in California, are selected and surveyed. The survey uses three separate samples, all of which are administered through a computer-assisted telephone interview (CATI) system. The survey includes a random digital dial sample, surname sample and a statewide cell phone sample. Randomly, adults, children or teens are asked to participate in the survey. Starting in 2007, CHIS began including a sample of cell-phone-only households who tend to be younger, more mobile than the regular households with landline telephones and engage in riskier health behaviors. A sample of

telephone numbers are randomly selected using computers in each of the 44 geographic areas of the state. A large sample that is representative of the diverse population in the state is taken. The survey is conducted in five languages to capture diversity: English, Chinese (Mandarin), Cantonese, Vietnamese, Korean and Spanish (California Health Interview Survey, 2007).

### **Participants used in the Survey from CHIS**

This study used a subset from the CHIS 2007 dataset to determine the attitudes of parents towards HPV vaccine and the various factors, which might influence it. The original survey used random selection using a computer and a sampled landline RDD number which was called and an adult from each household was identified as a respondent. Questions regarding people living in the household, number and age of adolescents (ages 12-17) and children (under age 12) were asked. The adult most knowledgeable about the health conditions of the children completed the interview. In houses with either children (under age 12) and/or adolescents (ages 12-17), one adolescent and one child were randomly selected by the original survey.

In 2007, CHIS interviewed 53,611 households including 51,048 adults, 9,913 children and 3,638 adolescents (California Health Interview Survey, 2007). The average child and adolescent interviews took 17.5 to 20 minutes, respectively, and the average adult interview took 35 minutes to complete. The response rate for the landline sample varied with 52.8 percent for adults, 44.1 percent for adolescents and 73.7 percent for children.

A separate RDD sample was drawn of telephone numbers that were assigned to cellular service in 2007; the idea was to complete 800 interviews in households with cell phone numbers to support the same level of stratification as in landline numbers. If two adults shared the number, only one was selected for the interview. No interviews were done with adolescents and children from the CHIS cell RDD sample.

## **CHIS Procedures**

A private firm was hired by the UCLA Center for Health Policy research to conduct the CHIS 2007 survey. The questionnaire for the adult interview contained 15 sections that covered demographics, health conditions and behaviors, women's health, and mental health. The children's questionnaire included eight sections covering demographics, physical status, parental involvement, access and use of health care services and physical activity. For this study the study data from the adolescent survey was used which included questions covering 12 sections demographics, physical activity, health status and conditions, diet and nutrition, environment, alcohol and drug use and the last one interpersonal violence.

This study used data from the 2007 Adult California Health Interview Survey (CHIS) and the research focused on parents of adolescents (12-17 age) and children (under 12) to determine the relationship between race, education level, awareness regarding HPV and influence of provider recommendation on HPV acceptability.

**Dependent variable:** The willingness of the parent to have their child vaccinated for HPV was determined from the respondent's answer to question AE80 of the 2007 CHIS: "Parental concern: Interested in HPV vaccine?" The coded responses were as follows: Yes = 1 and No = 2. The primary comparison was between those who answered "Yes" and those who answered "No" to the question.

**Independent variables:** The outcome variables of interest were race, education level of parents, HPV awareness and provider recommendation.

**Query I:** Influence of education level of parents on acceptability of HPV vaccination for their children. Responses to the Question AH47: "What is the highest level of education

completed and received credit for?” were analyzed. Table 2 responses were coded to missing values; Table 3 represents the coded responses to the question AH47.

**Query II:** Influence of race and ethnicity on the vaccine acceptability of parents. Chi square test was used to determine the relationship between race and vaccination rates. The race of the individual was captured in CHIS Question AA5F: “What is the race, ethnicity most identified with?” and the following responses from Table 2 were coded to missing values; Table 3 represents the coded responses to the questions AA5F.

**Query III:** Influence of knowledge and the consequences of HPV infection in shaping the decision of parents. The relationship between vaccination rates and the above factors was determined using a Chi square test. Responses to the Question AE81: “What is the main reason for not getting HPV vaccine for their children?” and the following responses from Table 2 were coded to missing values; Table 3 represents the coded responses to the questions AE81.

**Query IV:** Influence of provider recommendation on HPV acceptability among parents. Responses to the question AE73\_1: “Have you ever heard about HPV from your provider?” Table 2 responses were coded to missing values; Table 3 represents the coded responses to the questions AE73\_1.

## Statistical Analyses

All the analyses were conducted using the Statistical Package for Social Sciences (SPSS), Version 20.0. Chi square test was used for testing the all queries to analyze the sample data (Table 1). Tables 2 and 3 include the codes used for answers in the CHIS database.

Table 1. Analyses Conducted

Queries	Independent variable	Dependent variable	Test
1) Education of parents who got their children vaccinated	Education (Ordinal)	HPV Acceptability	Chi Square test
2) Do white children have the highest percentage vaccination rates	Race & Ethnicity (Categorical)	HPV Acceptability	Chi square test
3) Acceptance among parents with provider recommendation	Provider Recommendation (Categorical)	HPV Acceptability	Chi square test
4) Acceptability among parents who were aware of the consequences of HPV infection	HPV Awareness (Categorical)	HPV Acceptability	Chi square test

Table 2 Responses for missing values in Queries I to IV

Responses	Coded answers
Not applicable	-1
Don't know	-2
Refused	-9
Inapplicable	-8

Table 3. Responses for Queries I to IV

Responses for Query I	Responses for Query II	Responses for Query III	Responses for Query IV	Coded answers
Grades 1-8	Hispanic	No need for the vaccine	Yes	1
Grades 9-11	White	Adolescent/child is not sexually active	No	2
High school Diploma	African American	Expensive Vaccine	N/A	3
College	American Indian/ Alaskan Native	Adolescent/child is too old for the vaccine	N/A	4
Vocational School	Asian	Lack of Doctor Recommendation	N/A	5
Associate Degree	Native Hawaiian/Pacific Islander	Safety issues	N/A	6
Bachelor's Degree	Two or more races	Lack of Knowledge	N/A	7
Graduate Degree	N/A	Miscellaneous	N/A	8
Master's Degree	N/A	N/A	N/A	9
Doctorate or higher	N/A	N/A	N/A	10
No formal education	N/A	N/A	N/A	91



## Results

### Descriptive Statistics

The California Health Interview Survey (CHIS) collected data in 2007 which included a sample of parents having children in the age group of 9 to 15 years (CHIS, 2007). Table 4 provides the total sample size and the sample size based on gender and race from the CHIS survey. Sample data was extracted from CHIS database to conduct Chi square studies for all the four Queries. Each variable from the Query sample sizes was tested against the total sample size to obtain the Chi square value.

Table 4. Sample Size Subgroups from CHIS survey

Description	Sample Size
Total	51,048
Males	27,067
Females	23,981

Education of parents plays an important role in making them an informed consumer thereby helping them make a better decision for their kids. When parents were asked regarding their education level, the highest percentages were Ph.D., Master's and Bachelor's degree. Table 5 has the sample size based on the education level of parents.

Table 5. Sample Size for Query I

Description	Sample Size
Ph.D.	17,357
Masters	12,251
Bachelors	11,741
Diploma	5,104
High school	2,552
No formal education	2,041

It is important to assess the HPV awareness in population and identify racial gaps in the vaccination rates. When asked questions regarding the identified race of the parents, the majority of the participants identified themselves as white. Table 6 contains the data categorized by ethnicity.

Table 6. Sample Size for Query II

Description	Sample Size
Hispanics	9,077
White Americans	33,410
African Americans	2,410
American Indian Origin	423
Asian	4,345
Native Hawaiian	96
Two or more races	1,287

Table 7 contains the data set based on the awareness about the vaccine and the acceptance after physician recommendation.

Table 7. Sample Size for Query III and IV

Description	Sample Size for Yes	Sample Size for No
Heard about HPV Vaccine	40,838	28,587
Acceptance based on Physician Recommendation	10,210	22,461

Table 8 contains the Chi square results of each cross tabulation with the ‘p’ value for the query. These values are used to discuss about the dependency of the above factors on the HPV acceptance rate.

Table 8. Results of the Chi Square Test

Query	Independent Variable	Dependent variable	Values
I	Education of parents (Highest education level)	HPV Acceptability (Interested in getting HPV vaccine for child)	$\chi^2=36.092$ , p=.001
II	Race and Ethnicity(Current race and ethnicity)	HPV Acceptability (Interested in getting HPV vaccine for child)	$\chi^2=42.092$ , p=.000
III	Heard about HPV from provider(would say yes to the vaccine if doctor recommended it )	HPV Acceptability (Interested in getting HPV vaccine for child)	$\chi^2=6.086$ , p=.014
IV	Ever heard about HPV	HPV Acceptability (Interested in getting HPV vaccine for child)	$\chi^2=2.721$ , p=.099

## Discussion

The purpose of the study was to investigate the influence of education, race and ethnicity, physician recommendation, and awareness of HPV on HPV vaccine acceptability among parents of adolescents. Education and race/ethnicity of the parents was thought to have had an influence on vaccine acceptance for their children. Additionally, vaccine acceptance was thought to have been better among parents with HPV awareness and that provider recommendation was crucial in wanting children vaccinated. The survey data were analyzed and statistical tests performed to investigate these assumptions. The Chi Square analyses (Table 8) showed that groups did differ by race and education, but provider recommendation and HPV awareness were not related to parental attitudes towards vaccination.

The results of this study show that 80 percent of parents heard about HPV and 20 percent of the parents did not even hear about HPV infection and the consequences (Table 7). Further questions regarding how parents heard about HPV show that 44 percent of them heard from provider, 22 percent from Internet, 15 percent from media and 12 percent from school vaccination programs. It is observed that even though the majority of parents had access to provider services, most of them still did not have enough information to make the decisions for their children.

Query IV predicted that HPV acceptability was higher among parents who were well aware of the HPV virus. The chi square test was used to determine the association between HPV awareness and acceptability among parents. The association was not found to be statistically significant. The values show that ( $\chi^2(1, N=1878) = 6.086, p < .099$ ) indicating that there is not a significant relationship between awareness and acceptability among parents.

Providers prefer to recommend vaccination to older rather than young children and this becomes a missed opportunity for non-vaccination. Most of the time vaccines are delayed (not refusal) to avoid the subject of children's sexuality so vaccination becomes an issue of timing. Despite the best intentions of providers and parents, temporary delays become permanent non-vaccinations either due to lack of visits and reluctance to discuss sexuality (Table 7).

Table 7 data were used to calculate the results for Query III, the results predicted that vaccine acceptance was higher with provider recommendation. Chi square test was used to determine the association between provider recommending the vaccine and the number of children receiving the vaccine. The association was found to be statistically insignificant ( $\chi^2 (1, N = 53) = 6.086, p < .014$ ) and there was only a slight difference in the number of parents accepting the vaccine before and after provider recommendation.

Table 5 sample data was used to calculate the Chi square for Query I (Table 8), the results predicted that the education of parents who got their children vaccinated was higher. Chi square test was conducted to determine the relationship between the level of Education and HPV acceptability among parents. Basing on the results we fail to reject the null hypothesis and support that there was a significant association between educational attainment and vaccine acceptability among parents ( $\chi^2 (10, N = 2086) = 36.092, p < .001$ ).

Data from table 6 was used to determine the Chi square value for Query II (Table 8), the results predicted that white children showed better vaccination compared to other races. Chi square test was used to determine the association between Race/Ethnicity and Vaccine acceptability among children. The association was found to be statistically significant ( $\chi^2 (6, N = 1878) = 42.092, p < .001$ ) and racial, ethnic factors did play a role in vaccination decisions of parents.

## **Limitations**

The biggest problem with the dataset was that it was about acceptability and not actuality. Limited information was available regarding the actual results for the acceptability range among parents. The data was limited to one region, and was focused on the acceptability rate more than the factors involved and the preventive measures. The study also did not concentrate on English proficiency of parents that will help in understanding language barriers faced by parents. Study done on Latino parents' shows that parent with limited English proficiency were less likely to be exposed to education materials related to cervical cancer (Kepka, Coronado, Rodriguez & Thompson, 2012).

## **Conclusion**

Although raising awareness motivates parents to learn about HPV, it also produces anxiety and fear in them so care must be exercised not to cause undue public harm. HPV should be explained as public health issue rather than a sexually transmitted infection emphasizing the available options for prevention and treatment as we can see the clear distinction between the acceptability rates among participants who were aware about this disease were 80% of the total study participants. In the end better knowledge and better availability of vaccines will play a significant role in achieving the goal of better acceptability from parents and also adolescents. From this study it was clearly observed that parents with higher educational background had the higher percentage of acceptance rate for HPV vaccine among their children. Query II and as per the Chi square tests the results show that, the association between race/ethnicity and HPV acceptability among parents was found to be statistically significant; where the majority of Whites and Hispanics responded positive towards the HPV vaccination for their children. Results for Query III suggested that association between physician recommendation and HPV acceptability among parents was not found to be statistically significant. Successful vaccine compliance always depends on patient, provider and parent attitudes and awareness towards the vaccine. Studies with integration of all the possible strategies along with public acceptance will protect future generations from such diseases.

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