Effect of Health Beliefs and Acculturation on HPV Vaccine Acceptance among
Asian Indian Parents

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Dedications

I dedicate this thesis to my parents, George and Annamma Thomas who always have served as the greatest pillars of inspiration and encouragement in my life. I would also like to dedicate this work to my loving husband, Manuel Mathew, whose genuine support, immense patience, and sustaining faith in my abilities have often amazed me. Lastly, I would like to dedicate this work to my children Nivea, Nikhil, and Neha for their constant understanding, confidence, and much needed cheerleading throughout their mother’s scholarly expedition; I could not have done this without each one of you. Thank you for your sacrifices and unconditional love.
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Table of Contents

LIST OF TABLES...........................................................................................................vii

LIST OF FIGURES...........................................................................................................viii

ABSTRACT.........................................................................................................................ix

1. CHAPTER 1. INTRODUCTIONS AND OVERVIEW..............................................1
  1.1 Introduction and Specific Aims.............................................................................1
  1.2 Theoretical Framework.......................................................................................10
  1.3 Significance.........................................................................................................14
  1.4 Implications for Nursing Practice......................................................................14
  1.5 Definition of Terms............................................................................................14

2. CHAPTER 2. REVIEW OF THE LITERATURE..................................................18
  2.1 What is HPV? .....................................................................................................20
  2.2 HPV Risk Factors..............................................................................................21
  2.3 Epidemiology of HPV.........................................................................................21
  2.4 Disease Burden in the United States.................................................................22
  2.5 Psychological Effects of HPV Infection............................................................23
  2.6 Prevention of HPV.............................................................................................26
  2.7 HPV Vaccination Rates.....................................................................................28
  2.8 Parental Acceptance of HPV Vaccination and Health Beliefs ......................28
  2.9 Effect of Ethnicity and Race on HPV Vaccination Acceptance.......................42
  2.10 Effect of Acculturation......................................................................................47
  2.11 Effect of Educational Level on HPV Vaccination Acceptance.......................48
  2.12 Effect of Religion in HPV Vaccination Acceptance.......................................50
EFFECT OF HEALTH BELIEFS AND ACCULTURATION ON HPV

2.13 Effect of Child’ Gender in HPV Vaccination Acceptance 53
2.14 Subjective Norms 54
2.15 Personal Experience of the Disease 56
2.16 Asian Indians in the United States 57
2.17 Asian Indian Parental HPV Vaccine Acceptance 59
2.18 Hepatitis B Vaccine Acceptability 62
2.19 Summary 64

3. CHAPTER 3. RESEARCH DESIGN AND METHODOLOGY 70
3.1 Research Design 70
3.2 Population and Sample 70
3.3 Sampling Methods and Recruitment 71
3.4 Instruments 73
3.5 Data Collection procedures 78
3.6 Data Analysis 79
3.7 Human Subjects 81

4. CHAPTER 4. RESULTS 83
4.1 Enrolment of Participants 83
4.2 Demographic Data – Sample Characteristics 85
4.3 Bivariate Analysis 90
4.4 Aim 1 92
4.5 Aim 2 92
4.5 Aim 3 96
4.6 Secondary Aims 99
List of Tables

Table 2.1 HPV Associated Diseases in Men and Women (CDC, 2012)…………………20
Table 4.1 Total Sample – Demographic Characteristics………………………………86
Table 4.2 Age and Gender of Youngest Children………………………………………87
Table 4.3 Hepatitis B and HPV vaccination Status – Youngest Children………………88
Table 4.4 Parental Perceptions about HPV Vaccination……………………………………..89
Table 4.5 Personal Experience of the Disease………………………………………………90
Table 4.6 Bivariate Analysis ………………………………………………………………91
Table 4.7 HBV vs HPV Acceptance………………………………………………………92
Table 4.8 Logistic Regression – Aim 2……………………………………………………95
Table 4.9 Logistic Regression – Aim 3……………………………………………………97
Table 4.10 Additional Analysis…………………………………………………………100
Table 4.11 Hepatitis B and HPV Vaccination Acceptance if Offered in Infancy………101
Table 4.12 Open Ended Questions………………………………………………………104
List of Figures

Figure 1.1 Modified Health Belief Model .................................................. 13
Figure 4.1 Enrolment ................................................................................. 84
Figure 5.1 Modified HBM Predicting Vaccination Acceptance .................. 123
Abstract

**Background:** Asian Indians are considered the third largest Asian community in the United States numbering 3.2 million per records from the U.S. census bureau for the year 2010, but little is known about Asian Indian parents’ acceptance of the HPV vaccine for their children. Human Papillomavirus (HPV) is the most common sexually transmitted disease in the United States. Even though HPV vaccination is highly effective in preventing HPV infection, many studies have proposed that the vaccination rates in general are low. According to the teen vaccination coverage report by Center for Disease Control in 2014, only 37.6% of girls and 13.9% of boys between the age group of 13 – 17 years received all three doses of HPV vaccination. The key determinant of HPV vaccination rates is parental acceptance. The major factors affecting parental acceptance of HPV vaccination include health beliefs, educational level, religion, child’s gender, subjective norms, (peer, family, and social pressure), and personal experience of the disease. While there are several studies in the U.S that have examined parental acceptance of HPV vaccination in general, to date there were no studies specifically focusing on Asian Indian parents living in the U.S, nor any that had assessed the effects of acculturation (cultural identity) on HPV acceptance in the commonly available databases. Therefore, because the factors affecting HPV vaccination acceptance of Asian Indian parents are unknown, the purpose of this study was to determine the effects of health beliefs (perceived seriousness, perceived susceptibility, perceived barriers, perceived benefits) and acculturation (cultural identity) and to explore the effects of educational level, religion, child’s gender, subjective norms, and personal experience of the disease on Asian Indian parental acceptance of the HPV vaccine.
**Methods:** A comparative descriptive cross-sectional design based on a theoretical framework of Health Belief Model was used for the study. The sample, Asian Indian parents, who have children between the ages of 9–16 years, were recruited from various places of worship and community organizations from the Houston Metropolitan area and all over the U.S. Participants were recruited directly, with the help of formal and informal leaders of these organizations and through email. Participants were provided with a web-link for the research survey to assess the effect of health beliefs, acculturation, and demographic factors on HPV vaccine acceptance. As established by previous research on non-Asian Indian parents, the acceptance of at least one dose of HPV vaccination was expected to be 45% and the acceptance of Hepatitis B vaccination to be 90%. Using the above estimates, a sample size of 160 participants was deemed sufficient to achieve 81% power to detect a difference between group proportions of 0.45 with a significance level (alpha) of 0.05 using a two-sided two dependent group McNemar test. The same sample size is sufficient for hierarchical logistic regression analysis to achieve 81% power, 0.05 alpha, and a 1.65 Odds Ratio. The expected survey response rate was about 50%, based on previous research conducted to examine variations in response rates to email surveys.

**Data Analysis:** The obtained data was directly entered into SPSS and then cleaned, coded, and checked for shape of distribution and outliers, and then analyzed using descriptive statistics. The rates of HPV vaccination acceptance was compared to Hepatitis B vaccination acceptance using a two-sided two dependent group McNemar Chi square test. The effect of health beliefs and acculturation on vaccination acceptance was carried out using hierarchical logistic regression models. Educational level, religion, and child’s gender were added as covariates in the first step; subjective norms, and personal
experience of the disease were added as co-variates in the second step; and health beliefs and acculturation were added in the third step of the logistic regression model.

**Results:** The findings suggested that Asian Indian parents were significantly more likely to accept Hepatitis B vaccination than HPV vaccination (OR = 27.7, \( P < 0.0001 \)). Among health beliefs, parents who expressed higher levels of perceived barriers were less than half as likely to accept HPV vaccination acceptance (OR = 0.47, \( P = 0.02 \)). Subjective norms excluding spousal opinion positively predicted HPV vaccination acceptance where parents were more than one and half times more likely to accept the vaccination (OR = 1.7, \( P = 0.05 \)). However, among the subjective norms variables, spousal opinion predicted a negative effect on vaccination where parents were slightly more than half as likely to accept the vaccination (OR = 0.59, \( P = 0.01 \)).

**Implications:** Knowledge from the findings of this study may inform educational programs to improve Asian Indian parental vaccination acceptance rates and reduce the prevalence of HPV and its sequelae among their children. Likely factors influencing HPV vaccination acceptance among Asian Indian parents became evident through this study conforming to the modified HBM theoretical framework used, displaying the effect of perceived barriers and subjective norms on vaccination acceptance. Educational interventions targeting perceived barriers, spousal opinion, pediatric providers, and other significant people who have an influential effect on parents may positively affect HPV vaccination rates among this population. Moreover, educating healthcare personnel, including providers and nurses about these specific factors may help to modify their approach in promoting HPV vaccination.
EFFECT OF HEALTH BELIEFS AND ACCULTURATION ON HPV
Effect of Health Beliefs and Acculturation on HPV Vaccine Acceptance among Asian Indian Parents

Chapter 1: Introduction and Overview

1.1 Introduction and Specific Aims

The main purpose of this study was to determine if there is a difference in acceptance rates between Human Papillomavirus (HPV) vaccination and Hepatitis B vaccination among Asian Indian parents for their children and to examine the effect of health beliefs (perceived seriousness, perceived susceptibility, perceived barriers, perceived benefits) and acculturation (cultural identity) on HPV vaccination acceptance. In addition, this study explored how educational level, religion, child’s gender, subjective norms, and personal experience with HPV may affect HPV vaccine acceptance among Asian Indian parents. The primary research question was: “Among Asian Indian parents, what is the rate of parental acceptance of HPV vaccination compared to Hepatitis B vaccination for their children?”

Human Papillomavirus (HPV). HPV is a small, double stranded DNA virus believed to be coexisting with humans for thousands of years (Center for Disease Control [CDC], 2012). Human Papillomavirus (HPV) is the most common sexually transmitted disease in the United States (CDC, 2012). Even though the association between HPV and sexual behaviors were suspected for more than 100 years, clear evidence was established by the presence of HPV in cancer stricken cervical cells in the 1990s (CDC, 2012). The HPV strains that affect mucous membranes are further subdivided into two groups: the high risk oncogenic and low risk or non-oncogenic viruses (Castellsague, 2008). As per the CDC (2012), HPV is comprised of 40 strains that affect the mucous membranes. Of
the 40 strains, four types (6, 11, 16, and 18) cause most of the cervical and anal cancers as well as genital warts.

**HPV Risk Factors.** The risk factors of HPV are mainly associated with sexual behavior of individuals. The number of sex partners and young age are the most significant risk factors for transmission of HPV (CDC, 2012). Some other factors such as age of sexual debut, increased parity, and long term use of oral contraceptives also have been identified as possible risk factors (CDC, 2012).

**Epidemiology of HPV.** There are about 14,100,000 annual new infections of HPV in the United States, with a prevalence rate of 79,100,000 at any given time (CDC, 2012). The significance of this problem is further evidenced by the possibility that 80% of all sexually active women by the age of 50 will have a history of HPV at some point in their lives (CDC, 2012). The communicability of the disease is recognized to be high and the infection often appears soon after the onset of sexual activity. Despite a tendency for the infection to clear spontaneously, in some cases the infection tends to persist, eventually causing carcinogenic changes (Steben & Duarte-Franco, 2007).

**Disease Burden in the United States.** There is a substantial financial burden related to HPV infection in the country. The annual estimated cost of HPV related diagnosis and treatment ranges from US $2.25 billion to $4.6 billion (Fleurence, Dixon, Milanova, & Beusterien, 2007). An assessment of the medical expenses established that HPV infection is similar to HIV infection when it comes to total costs involved in managing the disease (Steben & Duarte-Franco, 2007). The American Cancer Society (ACS) estimates that about 12,300 new cases of cervical cancer are diagnosed every year resulting in the death of about 4,000 women annually in the U.S (ACS, 2013). Up to 75%
of new infections occur among adolescents and young adults between the ages of 15 to 24 years.

**Psychological effects of HPV infection.** The psychological effects of both low-risk and high-risk HPV infection cannot be underestimated (Graziottin & Serafini, 2009). Emotions of anger, depression, and anxiety seem to be the most commonly reported psychological effects. However, a direct correlation between HPV infection and emotional disturbances has yet to be established due to lack of research studying just the two factors (Graziottin & Serafini, 2009). The psychological effects stem mainly from the stigma associated with contracting a sexually transmitted disease, especially genital warts. Higher levels of anxiety, fear, and obsessive compulsive behavior about hygiene and infection are likely following the diagnosis (Escalas, Rodriguez-Cerdeira, & Guerra-Tapia, 2009).

**Prevention.** From a public health point of view, unlike the usual problem of limited resources versus increased demand, the concern with HPV vaccination refusal is related to the economic burden of treating a disease that very well could have been prevented by vaccination. Generally speaking, vaccinations are preventive interventions that provide the best economical healthcare value (Armstrong, 2007). Even though the number of infectious cases may appear minimal during the post-vaccine era in general, the physical, mental and economic impact of such infections is very high (Kutty et al., 2013).

Childhood vaccination programs are considered major milestones in the history of public health in preventing infectious diseases (CDC, 2011). The CDC, in its report titled ‘Ten Great Public Achievements” further asserts that the prevention of infectious
diseases by vaccination has far-reaching social and economic impact. The report estimates that about 14 billion dollars in direct costs and 69 billion dollars in societal costs have been saved for each birth cohort due to vaccination related disease prevention. Secondary only to clean drinking water, vaccinations have been instrumental in keeping the once dreaded infections curbed or even extinct (Andre et al., 2008).

The only guaranteed preventive measure against HPV is abstinence from sexual activity. Another effective preventive strategy is maintaining a monogamous sexual relationship with an uninfected partner. Transmission can also be minimized, but not eliminated, by the use of barrier methods such as condoms (CDC, 2012). In 2006, the Gardasil™ vaccine was introduced to prevent infection by the most common four major strains of HPV (CDC, 2013). Despite the fact the vaccine is limited to prevention of only four strains of HPV, its efficacy has been well established through several global research initiatives (Teen Vaccination Coverage, 2011). One notable study conducted in Australia to determine the effectiveness of the Gardasil™ vaccine to prevent cervical anomalies concluded that the vaccine provided statistically significant protection against cervical abnormalities in young women (Crowe et al., 2014). A systematic review examining 15 studies (10 randomized controlled trials and 5 observational studies) also concurred that short term protection (3 years) against cervical lesions is as high as 83% (95% CI: 70-90%) whereas the long term protection is still to be determined related to the nascent nature of the vaccine (Delere et al., 2014).

**HPV vaccination rates.** While research findings suggest that the HPV vaccine has high efficacy in prevention of HPV infection, many studies have suggested that the vaccination rates are still low (CDC, 2012). According to CDC, only 37.6% of girls and
13.9% of boys between the age group of 13 – 17 years received all three doses of HPV vaccination in 2013 (Teen Vaccination Coverage, CDC, 2014). The same report estimates that about 60% of children receive at least one dose of the vaccination. When compared to the rates of other common childhood vaccinations, the HPV vaccination rates are significantly lower. As per a recent immunization report published by the CDC, there are wide variations among vaccination rates between different types of childhood vaccines that may be attributable to vaccine acceptability (CDC, 2013).

**Parental HPV Vaccine Acceptance.** Parental vaccination acceptance for their children is a major issue in the developed nations and vaccination safety attracts more public opinion than its efficacy. Findings from the Centers for Disease Control suggest the tendency to refuse childhood vaccinations is increasing in the United States (CDC, 2013). Parental attitude about HPV vaccine is the key determinant of vaccination rates (Kahn et al., 2009). Parental refusal may stem from factors such as the false belief that they can control the child’s exposure to disease, inadequate information about safety and efficacy of vaccinations, and even a notion that herd immunity may save their child from acquiring the disease (American Academy of Pediatrics [AAP], n.d). Some of this refusal may also be attributable to organizations, online resources, and interest groups who spread fear of possible complications related to vaccinations (Andre et al., 2008).

Health beliefs among parents have also been identified as key determinants of HPV vaccination acceptance. Parental belief in possible adverse behavioral effects for their children such as early sexual debut and sexual promiscuity related to the vaccine have been cited as factors leading to HPV vaccination refusal (Reynolds & O’Connell, 2012). The likelihood of a parent immunizing a child also depends on the perceived
positivity of the outcome by performing the behavior (Montano & Kasprzyk, 2002).

There has been extensive research on the acceptability of HPV vaccine and a number of other factors also have been identified as possible explanations for vaccination acceptance such as ethnicity and race, educational level, religion, child’s gender, subjective norms, and personal experience with HPV infection (Reynolds & O’Connell, 2012).

The effect of ethnicity and race has been studied expansively concluding that ethnic and racial minorities tend to have lower acceptance of HPV vaccine (Lechuga, Swain, & Weinhardt, 2011; Perkins et al, 2010; Constantine & Jerman, 2007). The variable of acculturation has not been the subject of any known studies related to HPV vaccination acceptance.

Some demographics play an active role in HPV vaccination acceptance among parents. While parental age and socioeconomic factors are not correlated with HPV vaccine acceptance, parental educational level seems to play an important role in acceptance of the HPV vaccination (Constantine & Jerman, 2007; Ogilvie et al., 2007). Parents with lower education expressed more willingness to vaccinate their daughters who were younger than 13 years old (Constantine & Jerman, 2007). Many studies carried out in the U.S to determine the effect of religion concluded that religion does play a role on HPV vaccine acceptance. Protestant parents were more conservative about vaccinations and preferred vaccinating no one, not just their children. Parents who attend regular religious services were found to be less likely to favor vaccination with the religious denomination making no substantial difference for this variable (Shelton et al., 2013).
Differences in vaccination acceptance based on child’s gender were specifically examined in some studies with the findings suggesting a preference to vaccinate girls more than boys in general (Liddon et al., 2010; Dempsey et al., 2011). In addition to these factors, subjective norms and personal experience of the disease may also affect parental HPV vaccination acceptance (Dempsey et al., 2006; Rosenthal et al., 2008). Subjective norms relate to a person's beliefs about whether peers and people of importance (such as family and the community) would want him or her to engage in the behavior (Ajzen, 1991). Subjective norms seem to be more of a determining factor in HPV vaccination acceptance among the Hispanic population compared to non-Hispanic White and African American populations (Lechuga et al., 2011). In the U.S, African American mothers and Hispanic parents seem to have stronger inclination to vaccinate their children against HPV if they have had prior experience with HPV infection or any STIs as well as knowledge about an acquaintance that had the disease (Lechuga et al., 2011).

**Hepatitis B vaccination Acceptance:** Similar to HPV vaccination, Hepatitis B vaccination is also a three-dose series vaccination normally administered in childhood. Despite the fact that both the Hepatitis B vaccine and the HPV vaccine require three doses, the rate of HPV vaccination is much lower. While it has been reported that more than 92% of children completed the three dose course of Hepatitis B vaccination, only 37.6% girls and 13.9% of boys received all three doses of the HPV vaccine (CDC, 2014). Due to global and domestic vaccination programs, Hepatitis B incidence rates showed an 82% decline from 1990 to 2007 in the U.S (Daniels, Grytdal, & Wasley, 2007). Unlike Hepatitis B vaccination that is offered just after birth and during infancy, HPV
vaccination is offered in pre-adolescence and adolescence. To address this discrepancy, the current study offered a question that assesses whether parents would be more likely to accept the HPV vaccine if offered at birth and infancy along with the HBV vaccine.

**Asian Indian Parental HPV Vaccine Acceptance:** While many studies have explored parental HPV vaccination acceptance in general, there are very few studies targeting ethnic minorities and none have assessed the effects of acculturation in the United States, especially Asian Indians, regarding HPV vaccination refusal.

Acculturation (cultural identity) is defined as a cultural learning process experienced by individuals who are exposed to a new culture or ethnic group (Sage Publications, n.d. p.102). The same article identifies acculturation as one of the major concepts included in majority of ethnic psychological studies. When individuals are exposed to a new culture over a period of time, they tend to embrace some of the cultural practices of the majority while still holding on to many of their original cultural values (Sage Publications. n.d). Some studies identify acculturation as a major factor in healthcare decision making but none are specific to vaccination acceptance (Bito et al., 2007).

There was one study in England which examined Southeast Asian parents’ rationale for refusing vaccination of their children against HPV (Marlow, Wardle, Forester, & Waller, 2009). Among ethnic minorities, Southeast Asians seem to possess major reservations about the HPV vaccine as a result of their health beliefs. Research findings suggest that Southeast Asians are the most conservative group on HPV vaccine acceptance compared to White parents and displayed a stronger health belief that vaccination may encourage early sexual debut or promiscuity among their children.
Religion was identified as a key factor in HPV vaccination intentions among minority parents in England, with Christians from Southeast Asia expressing the least hostility towards HPV vaccination compared to Hindus and Muslims (Marlow et al. 2009). The role of the child’s gender was not specifically examined in most of the studies conducted in England because the emphasis was to determine parental acceptance of HPV vaccine for their daughters. There is no available literature in the U.S. discussing the effect of child’s gender on Asian Indian parents’ acceptance of the HPV vaccine, though an international study conducted in India by Paul et al (2013) pointed to parental preference in vaccinating boys as well.

Just as subjective norms affect HPV vaccine acceptance among U.S. parents in general, Asian Indian parents also tend to be more aware of social norms and expectations, and act accordingly. As observed by Percival Spear (n.d.), family (immediate as well as extended) is the most important social unit for almost all Asian Indians, and decisions on all aspects of life originate from the family which most of the time include the extended family. Further, the importance of societal norms is only second to family subjective norms in family decision-making. Though family comes first, peer pressure from close friends also may serve as an important factor in HPV vaccination acceptance. No literature is available regarding the effect of personal experience with HPV on HPV vaccination acceptance among Asian Indian Parents.

Since there were no major studies in the United States examining effects of health beliefs and acculturation on HPV vaccination acceptance among Asian Indian parents, evaluating these variables was an important first step to address the gaps in knowledge to support better health literacy for Asian Indian parents and their healthcare providers. In
addition, there are no major studies in the United States that have explored the effects of educational level, religion, child’s gender, subjective norms, and personal experience on Asian Indian parental acceptance of the HPV vaccine.

Therefore the primary aims of this study were to determine among Asian Indian parents if:

1. There is a difference in HPV vaccine acceptance compared to Hepatitis B vaccine acceptance for their children.
2. Health beliefs (perceived seriousness, susceptibility, barriers, and benefits) affect HPV vaccine acceptance for their children.
3. Acculturation (cultural identity) has an effect on HPV vaccine acceptance for their children.

The secondary aims of this study are to determine among Asian Indian parents if:

1. Educational level has a significant effect on HPV vaccine acceptance.
2. Religion has a significant effect on HPV vaccine acceptance.
3. Gender of the child affects HPV vaccine acceptance.
4. There is an association between subjective norms (parental peer, family, and societal influence) and HPV vaccine acceptance.
5. Personal experience with HPV affects HPV vaccine acceptance.

1.2. Theoretical Framework

The study used an adaptation of the Health Belief Model (HBM) as the main theoretical framework. The HBM, one of the prominent frameworks used in studies related to health promotion and prevention including vaccination uptake, uses predictors
of health related action in the absence of illness to understand healthcare decision-making (Reynolds & O’Connell, 2012). The theory was articulated in the early 1950s in an effort to explain why available medical screening services were not being used as often as expected (Hochbaum, 1958). There are four constructs for this model though lately three more constructs have been added. For the purpose of this study, the original four constructs, perceived seriousness, perceived susceptibility, perceived barriers, and perceived benefits, was utilized.

Perceived seriousness refers to Asian Indian parental belief about the severity or seriousness of HPV if acquired. The perception of seriousness comes from a personal level of understanding medical information or knowledge, or perceived difficulty caused by HPV in general (Health Belief Model, n.d.).

Perceived susceptibility refers to Asian Indian parental beliefs about the likelihood of their children acquiring HPV, hence prompting them to adopt preventive actions. It is reasonable to conclude that higher the perception of likelihood of contracting the disease, the greater the chances of accepting the health promoting behavior.

The construct of perceived barriers refers to Asian Indian parents’ perceptions of obstacles to vaccinating their children against HPV, including perceptions about possible adverse effects of HPV vaccination. In most cases, for someone to adopt a health promoting behavior, the perceived benefits need to outweigh the perceived barriers. According to Janz and Becker (1984), this is the most significant attribute that determines acceptance or rejection of a health promoting behavior. The construct of perceived benefit refers to Asian Indian parental perception about the advantages of engaging in the
health promoting behavior (HPV vaccination) in order to decrease the risk of the disease (Glanz, Rimer, & Viswanath, 2008).

The adapted model was used to examine the four constructs (perceived seriousness, perceived susceptibility, perceived benefits, and perceived barriers) as well as acculturation, educational level, religion, subjective norms, and personal experience of the disease to predict HPV vaccination acceptance among Asian Indian parents (Reiter, Brewer, Gottlieb, McRee, & Smith, 2009). This model helped to elucidate intentions to vaccinate in the given population. A diagrammatic representation of the modified HBM is given here as figure.1.
Figure 1.1 – Modified Health Belief Model
1.3 Significance

This study compared Asian Indian parental HPV vaccine acceptance and HBV vaccine acceptance, examining the effects of health beliefs and acculturation, and explored the effects of educational level, religion, child’s gender, subjective norms, and personal experience with HPV on HPV vaccine acceptance for their children. Knowledge from the findings of this study may inform educational programs to improve Asian Indian parental vaccination rates and reduce the prevalence of HPV and its sequelae among their children.

1.4 Implications for Nursing practice

Nurses, with three million members, are the largest body of the nation’s healthcare workforce and nurses should be utilized to their fullest extent of their education and training (The Institute of Medicine [IOM], 2010). In addition, nurses are pioneers in health promotion and maintenance and these two aspects invariably include vaccination. Further, Nursing is considered one of the most trustworthy professions in the U.S. and Asian Indian parents may place the most trust in the information conveyed by nurses (Robert Wood Johnson Foundation, 2013). Therefore, because nurses play a significant role in health promotion and need to be effective in educating Asian Indian parents about vaccinations, the factors affecting HPV vaccine acceptance in this population must be identified.

1.5. Definition of Terms

*Asian Indian parents:* For the purpose of this study, Asian Indian parents are defined as individuals who identify themselves as persons of Asian Indian origin living in
the United States. The participants were directed to self-identify their ethnicity in the questionnaire.

*Children:* For the purpose of this study, the term children refers to boys and girls from 9 to 16 years old whose parents are of Asian Indian origin.

*Ethnicity:* The term ethnicity is defined as a population of human beings whose members identify with each other on the basis of a real or presumed common genealogy or ancestry. The same ethnic groups tend to have shared cultural traits and a shared history (Ethnicity vs. Race, n.d). People of *Asian Indian ethnicity* living in the United States share a common identity with similar cultural background and traditions.

*Religion:* Despite the attempt by many philosophers and thinkers to define religion, a concrete definition of religion is still controversial. According to Merriam Webster dictionary a simple definition of religion can be summarized as: “the belief in a god or in a group of gods, or an organized system of beliefs, ceremonies, and rules used to worship a god or a group of gods” (Merriam-Webster dictionary, n.d., expression 1, 2). Even though there are many religions in India, for the purpose of this study, individuals belonging to three major religious groups were included: Hindus, Muslims, and Christians. The participants were directed to choose one of these options, in addition to a fourth option: “other”.

*Subjective Norms:* Subjective norms can be broadly defined the “perceived social pressure to perform or not to perform the behavior” (Consumer Health Informatics Research Resource [CHIRr], n.d.). In this study, subjective norms embodied the effect of peer pressure, family pressure, and societal pressure in HPV vaccination acceptance of Asian Indian parents.
Acculturation: Acculturation (cultural identity) is defined as a cultural learning process experienced by individuals who are exposed to a new culture or ethnic group (Sage publications, n.d.). Acculturation has been identified as an influential factor in HPV vaccination decision making among minority, immigrant parents. For the purpose of this study, due to lack of instruments measuring Asian Indian acculturation, an instrument designed to measure acculturation of all Asians living in the U.S was used.

HPV vaccine: Presently there are three available vaccines against HPV. For the purpose of this study, the term HPV vaccine refers to all three vaccines.

Hepatitis B Vaccine: Hepatitis B vaccine is a series of three vaccines used to protect against Hepatitis B infection. It is one of the recommended childhood vaccinations that are commonly given to children after birth and the three-dose series is usually completed within the first 6 months of life (Center for Disease Control [CDC], 2007).

Health Beliefs: are defined as the perceived seriousness of HPV, perceived susceptibility to HPV, perceived barriers to HPV vaccination, and perceived benefits of HPV vaccination. Health beliefs were measured by a valid and reliable tool to examine parental acceptance of HPV vaccine.

Perceived seriousness: Perceived seriousness is loosely defined as “one's opinion of how serious a condition and its consequences are” (Health Belief Model, n.d., table 1). According to Janz and Becker (1984), the dimensions of perceived severity can refer to medical or clinical consequences as well as potential social consequences. Within this context, six questions measured parental beliefs about pain, mortality, and embarrassment caused by their child contracting the disease.
**Perceived susceptibility to HPV:** Is defined as “one's opinion of the chances of getting a condition” (Health Belief Model, n.d., table 1). The subjective perception about vulnerability of contracting a disease may facilitate the decision to adopt preventive measures such as vaccinations. The questionnaire had a section with questions that specifically measured parental perceptions of their child’s susceptibility to contract the disease.

**Perceived Barriers:** Perceived barriers are defined as “the potential negative aspects of a particular health action that may act as impediments to undertaking the recommended behavior” (Janz & Becker, 1984, p.2). It is natural for a person to analyze the cost benefit of an action by assessing the expenses incurred, associated dangers and unpleasantness, and also other factors such as convenience and time requirements. There was a section of the questionnaire to measure the barriers to HPV vaccination such as discomfort related to intramuscular injections, fear of associated dangers, and potential for increase in risky sexual behavior among children.

**Perceived Benefits:** Refers to the belief in the efficacy of the advised action to reduce risk of contracting the disease or the seriousness of it. In order for a person to accept the course of action, it should appeal to him/her as feasible and efficacious (Janz & Becker, 1984). Questions measuring beliefs about personal and societal benefits from the HPV vaccine helped to identify perceived benefits.
Chapter 2: Review of the Literature

This chapter presents the available research evidence to define HPV, review risks for and epidemiology of HPV acquisition, review the disease burden of HPV infection and its psychological effects, discuss prevention and rates of HPV vaccination, discuss the factors associated with parental acceptance of the HPV vaccine via the Health Belief Model, and effect of ethnicity and race on HPV vaccine acceptance. Additionally, the effects of acculturation, educational status of parents, religion, child’s gender, subjective norms, and personal experience of the disease are also reviewed.

The ethnic and cultural background of Asian Indian parents living in the U.S. was explored in an effort to shed light on their health belief systems and effect of acculturation on healthcare decision-making including HPV vaccination acceptance. Furthermore, as for the general population, the effect of health beliefs, acculturation, educational status, religion, gender of the child, subjective norms, and personal experience of the disease was examined among Asian Indians with the intention to identify gaps in literature and the need for further research in the field. Since HPV vaccination acceptance rates were compared to Hepatitis B vaccination acceptance rates in the study, a detailed literature review of the Hepatitis B vaccination acceptance among parents was also carried out.

Search Methodology

The literature search was completed by searching mainly four electronic databases including Medline PubMed, Medline Ovid, Cochrane database, and CINAHL. The principal search terms employed were racial difference, vaccination beliefs, HPV vaccine, Asian Indians and HPV vaccine, Southeast Asians and HPV vaccine,
acculturation and HPV vaccine acceptance, Hepatitis B vaccine acceptance, and parental concerns and vaccines.

The Cochrane review database produced only three results for the search term ‘vaccine belief’ whereas ‘parental concerns about HPV vaccine’ yielded one article resulting in a total of four articles from this database. Combining ‘racial disparities’ and ‘HPV vaccine belief’ returned 107 articles in Medline PubMed that were further narrowed down when categorized according to relevance. Medline Ovid returned 326 articles using similar search terms, but only four articles were found to be specific to the topic of interest. The search in CINAHL involved a combination of search terms including ‘HPV vaccine rates’ and ‘racial difference,’ which produced 321 articles. Limits set on databases included humans, published in English, and primary research articles. Articles heavily depending on expert opinion, position statements, and practice manuals were excluded for the purpose of literature review, though information from these resources were used elsewhere to draw conclusions and directions for clinical application. The eligible studies included randomized controlled trials (RCTs), original research articles, qualitative studies, systematic reviews and meta-analyses. From a total of 758 articles obtained by searching the four different databases, 46 articles relevant to this literature search meeting the criteria for inclusion were chosen and content analysis of those articles was performed using the framework for review defined by Galvan (2013). Data extraction for each article included the type of the study, purpose, sample, setting, variables, research design, hypothesis, data analysis, significant findings, and study limitations. The details are given in PRISMA flow diagram in appendix 1.
2.1. What is HPV?

HPV is a small, double stranded DNA virus believed to be coexisting with humans for thousands of years (CDC, 2012). There are about 100 different strains identified so far depending on their genetic makeup and outer capsid protein (Castellsague, 2008). The HPV that affects the non-cutaneous areas of the body are called mucosotropic which accounts for 40 different strains. The mucosotropic strains can further be divided into high risk or oncogenic and low risk or non-oncogenic viruses (Castellsague, 2008). Humans are the only known reservoir of the virus. Most HPV infections are transient and asymptomatic causing no clinical disease. Despite of high infectivity, only 50% or less of high grade lesions caused by HPV proceed to become cervical cancer (National Cancer Institute [NCI], n.d). The most common clinical feature of HPV infection is anogenital warts, but in children it can cause recurrent respiratory papillomatosis (Steben & Duarte-Franco, 2007). The four strains (6, 11, 16, & 18) cause majority of the cervical and anal cancers and genital warts as given in table 1 (CDC, 2012).

Table 2.1 HPV Associated Diseases in Men and Women (CDC, 2012)

<table>
<thead>
<tr>
<th>Type</th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 and 18</td>
<td>70% of cervical cancers&lt;br&gt;70% of anal/genital cancers</td>
<td>70% of anal cancers</td>
</tr>
<tr>
<td>6 and 11</td>
<td>90% of genital warts&lt;br&gt;90% of Recurrent Respiratory Papillomatosis (RRP)</td>
<td>90% of genital warts&lt;br&gt;90% of RRP lesions</td>
</tr>
</tbody>
</table>
2. 2. HPV Risk Factors

Major risk factors include higher number of sex partners, life time history of multiple sex partners, less than 25 years in age, early sexual debut, impaired immune system, co-carcinogens such as cigarette smoking, increased parity, long term oral contraceptive use and history of chronic inflammation (Winer, Lee, & Hughes, 2003). Some of these risk factors contribute to oncogenic changes once infected. Even though all high risk HPV infections do not cause cancer, 99% of cervical cancers are caused by high risk HPV. Besides cervical cancer, other genital cancers such as vulvar cancer (50%), vaginal cancer (65%), and penile cancer (35%) also are linked to HPV. About 95% of anal cancers and 60% of oropharyngeal cancers also are associated to HPV infection (CDC, 2013). Furthermore, it is significant that two of the major cancers of the cervix – squamous cell and adenocarcinoma – are exclusively caused by high risk HPV (Schiffman, Castle, Jeronimo, Rodriguez, & Wacholder, 2007).

2. 3. Epidemiology of HPV

From the presented data it is evident that HPV is a very prevalent sexually transmitted infection in our society and infectivity of this virus is appallingly high. Due to the higher rates of infection and infectivity, the chances of an individual contracting the disease is high. There are about 14,100,000 annual new infections of HPV in the United States, with a prevalence rate of 79,100,000 at any given time (CDC, 2012). The disease is most prevalent among individuals less than 25 years old, but after the age of 30 years, the incidence rates decline. About 75% of new infections occur among individuals between the age group of 15-24 years (CDC, 2012). It has been estimated that over a five-year follow up period, about 60% of initially HPV negative women will end up...
acquiring HPV (Baseman & Koutsky, 2005). The infection is common among men as well, though it has not been studied as extensively in women (CDC, 2002).

The oncogenic (the high-risk HPV) strains seem to have a higher rate of incidence than the non-oncogenic (low risk HPV) strains. The most important risk factor is higher number of lifetime sex partners (Baseman & Koutsky, 2005). Direct sexual contact with an infected person is the major source of infection. Even though nonsexual transmission is possible, the likelihood of that is estimated to be very minimal (CDC, 2012). Treatment and follow up of infected individuals, especially women, can be costly.

2. 4. Disease Burden in the United States.

The cost related to HPV infection, screening and treatment have been studied extensively in the U.S. and worldwide in the past two decades. In the U.S, it has been established that cervical cancer screening, management of abnormal cytology, and treatment comes with very high costs, second only to HIV/AIDS. The estimated cost is between $2.25 billion to $4.6 billion with significant economic and social impact (Fleurence, Dixon, Milanova, & Beusterien, 2007). A research study applying mathematical models conducted by Chesson, Ekwueme, Saraiya, and Markowitz (2008) concluded that the estimated cost effectiveness of the HPV vaccine in the United States per quality adjusted life years ranged from $3,906 to $14,723. Similar studies in European countries such as Finland also have pointed to high costs of HPV infection, diagnosis, and management, while the vaccine seems to be a very cost effective method in preventing majority of these infections (Lehtinen, Nieminen, Apter, & Paavonen, 2014).
2. 5 Psychological Effects of HPV Infection

HPV infection, in addition to its physical effects, can initiate high levels of stress and anxiety related to the infection itself and its effects on social and sexual life (Graziottin & Serafini, 2009). Low-risk HPV infection causing genital warts with no malignancy potential seems to create the same level of anxiety and fear compared to high-risk HPV infection. Studies conducted before the debut of the HPV vaccine underscored the psychological effects of anogenital warts on infected individuals (Persson, Dahlof, & Krantz, 1993).

In a descriptive survey of 454 participants consisting of 349 women and 105 men who were already diagnosed as HPV positive aiming to examine the impact of HPV diagnosis, the majority of participants reported a range of negative emotions related to the diagnosis including anger, depression, shame and guilt (Escalas et al., 2009). Other demographics such as the setting or race of the participants were not reported by the researchers for this particular study. Approximately 73% of the participants expressed concerns about transmitting the disease while about 57% of participants were afraid of being judged by their acquaintances (Escalas et.al, 2009). Seventy-two percent of the participants felt they were less sexually desirable and 68% reported less enjoyment of sexual contact. The same study concluded that in addition to these concerns 71% of participants reported issues such as difficulty in approaching a new partner, and two-thirds of the participants reported experiencing depression, shame, low self-esteem, isolation, or all of these emotions.

An international cross-sectional descriptive study conducted among 166 participants (86 women and 80 men) diagnosed with genital warts from Canada (N = 30),
France (N = 34), Germany (N = 35), U.K (N = 31), and U.S (N = 36), to examine perceptions about treatment and impact on life style, concluded that high levels of anxiety were prevalent among individuals with genital warts (Maw, Reitano, & Roy, 1998).

Overall, 52% of men and 61% of women reported that they were either ‘quite’ or ‘very’ concerned about the diagnosis. Even though concerns varied from country to country, apprehension about risks associated with genital warts (66%) and change in life style (~ 60%) related to the diagnosis were common themes among participants from all countries.

A descriptive cross-sectional study of 51 women with a diagnosis of HPV, from an outpatient clinic in Athens, Greece, to examine the impact of HPV diagnosis on mental health and sexuality by capturing medical, demographic, sexual, and mental health information suggested that the participants did go through emotional turmoil following the diagnosis (Ferenidou et al., 2009). The mean age of the participants was 36 years, 86% lived in Athens, 62.8% had a college degree or higher and 60.8% were married or in a stable relationship. Feelings of anxiety (76.5%), guilt (41.1%), anger (43.1%), shame (21.5%), and low self-esteem (21.6%) were most common following the diagnosis. In addition to the psychological effects, the participants reported decrease in sexual desire (41.2%) and painful intercourse (23.5%) subsequent to the diagnosis.

Findings from a qualitative focus group interview study of 10 participants (five men and five women) recruited from a venereal disease clinic in Bispebjerg Hospital in Copenhagen, Denmark, examined the quality of life following the diagnosis of genital warts (Mortensen & Larsen, 2010). The study suggested that participants expressed various negative feelings associated with their acquired infection. Many reported feelings
of significant decrease in their quality of life related to a decline in their sexual and intimate relationships as expressed by a 26 year old male participant “the genital warts has definitely had a huge impact on my sex life. It’s a barrier for meeting new girls. Cause I stand there thinking ‘Wow, she’s nice. I’d like to take her home.’ But then, I don’t want to approach her cause... I’m simply not up to explaining it.” Guilt and anger related to the presence of warts was another overwhelming emotion expressed, as evidenced by a 21 year old female participant’s statement “I mean, you just have to wait and there’s nothing you can do yourself, is there? And then I get this feeling that I simply can’t relate to my own body or even look at it. Then I feel repulsive, you see?” Fear of social isolation is another strong after-effect; in the words of a 30 year old male participant this effect is highlighted “you’re afraid of being stigmatized. I remember having heard that somebody had a venereal disease... And that’s just what you’ll always remember about them, even if you don’t even see them anymore. Or if you’ve heard that about a girl that you might have thought was quite cute, then you would think ‘wasn’t it her who had that thing?’ In the same way you think that’s probably how others will think about you when you have genital warts, that they think ‘Oh, it’s that guy with genital warts.’ That’s why I have only told people I’m very close to” (Mortensen & Larsen, 2010, p. 5-8). One interesting finding from this study was that individuals found it harder to adjust to the diagnosis as time advanced rather than feeling optimistic over time. The feelings of pessimism and desperation about the diagnosis are evidenced in the following expression by a 23 year old participant (woman) “but then I thought ‘well, it’ll soon pass. I’ll just get a pill or something [she laughed].’ But it wasn’t exactly like that. Now, I’ve changed my perception pretty much. I’m really sick of it now (p. 5).”
The review of literature on psychological effects of HPV diagnosis highlights that participants experienced anxiety, depression, feelings of guilt, low self-esteem, anger, fear, decrease in quality of life, decreased sexual attraction and desire, social isolation, and shame associated with HPV infection. In many cases, these emotional effects increased over time.

2.6 Prevention of HPV

The only definite preventive measure is total abstinence from sexual activities. A long term monogamous sexual relationship with an HPV-negative partner also is likely to prevent contracting the infection (CDC, 2012). Currently, there are two available vaccinations to prevent HPV infections. The first vaccine to be approved by the US Food Drug Administration (FDA) was Gardasil™ in 2006 and the second vaccine, Cervarix™, was approved in 2009 (US Food and Drug Administration [FDA], n.d.). Gardasil™ is effective against four different strains (low risk 6&11, high risk 16 &18) of the HPV virus and can be given to girls, boys, women and men between the ages nine years to 26 years (FDA, n.d.). Even though the vaccination can be given to children from nine years on, the CDC vaccination schedule recommends administration from the age of 11 years (CDC, 2012). Cervarix™ is effective against only two strains of HPV (16 and 18), and is recommended by FDA only for girls and women between the ages of nine years and 26 years. A third vaccine, Gardasil 9, was approved by FDA on December 10, 2014. This vaccine covers five additional high risk strains of HPV (31, 33, 45, 52, and 58) (FDA, n.d.).

Vaccination refusal and outbreaks of subsequent preventable infections not only cause suffering and injury to the general public, but also depletion of valuable resources
with significant economic impact (Bayer & Fairchild, 2004). Vaccinations generally come under the category of prevention and health promotion; hence policies set forth to guide these concepts are applied to vaccinations as well (Carter, Cribb, & Allegrante, 2012). It is interesting to note that in Australia, the HPV vaccination Gardasil™ has been included in the national immunization programs since 2007 for girls and a steady decline in genital warts has been achieved since its introduction. In a national study conducted in Australia, researchers used a mathematical dynamic model to estimate future genital warts incidence comparing pre-vaccine age-specific genital warts incidence rates to current post-vaccine genital warts incidence rates. The model predicted near elimination of genital warts by extending the vaccination to all boys as well (Korostil et al., 2013).

Researchers carried out a retrospective analytical record review by extracting data from 52,454 new patient records between July 2004 and June 2011 from a major urban public health clinic in Melbourne, Australia with an aim to determine the population effect of an HPV vaccination program in Melbourne city (Read et al., 2011). The researchers specifically examined new genital warts incidence for two consecutive years from 2007 to 2008 (the year HPV vaccine was included in the national immunization program) and from 2010 to 2011 (estimated time frame for the vaccination to show possible statistically significant effect). The national immunization program covered only women between the ages of 12 years to 18 years. The results found 5,021 new cases (9.6% with 95% CI 9.3%, 9.8%) of genital warts, and that the occurrence of new genital warts among women less than 21 years decreased from 18.6% to 1.9% and from 22.9% to 2.9% among heterosexual men. There were no significant differences in genital warts occurrence among women above the age of 30 years (OR = 0.97, 95% CI 0.84, 1.12). The
researchers concluded that the decline in new genital wart incidence among heterosexual men and women could be attributed to the national vaccination program debut in 2007. Thus research findings and mathematical models support the notion that HPV vaccination is highly effective in preventing and or minimizing the transmission of HPV.

2.7 HPV Vaccination Rates

Despite known benefits, the HPV vaccination rates are still low in the United States even though many health insurance plans cover the cost of the vaccine under childhood immunization programs (CDC, 2012). Data from the CDC on vaccination rates among adolescents 13 years through 17 years found that although 57.3% of girls received the first dose of HPV vaccine in 2013, only 37.6% girls completed all three doses of the vaccine (Teen Vaccination Coverage, CDC, 2014). During the same time period, vaccination rate for boys was still lower, with 34.6% receiving only one dose and 13.9% receiving all three doses. The same report estimates that about 60% of children (boys and girls) in the general population received at least one dose of the HPV vaccination. The low rates of HPV vaccination in the U.S. may indicate that either the necessity of vaccinating children against HPV is not well understood or parents are significantly worried about effects of the vaccination on their children.

2.8 Parental Acceptance of HPV Vaccination and Health Beliefs.

The literature review suggested that multiple factors have been identified as contributory to parental acceptance of HPV vaccination including health beliefs, educational level, religion, subjective norms, and personal experience with the disease. Among these factors, health beliefs are further subdivided in to perceived seriousness, perceived susceptibility, perceived barriers, and perceived benefits.
2. 8.a Perceived seriousness. Higher rates of perceived seriousness of a disease are expected to motivate individuals to take preventive actions more readily (Health Belief Model, n.d.). Hence the construct of perceived seriousness stemming from the HBM is commonly used while studying vaccination acceptability and intentions to vaccinate in general (Sadique, Devlin, Edmunds, & Parkin, 2013).

Several studies have examined the role of perceived seriousness on parental acceptance of HPV vaccination. A descriptive cross-sectional survey study was conducted by Kahn et al. (2008) among 409 females 13 years old to 26 years old from primary care clinics in the Cincinnati metropolitan area to estimate HPV vaccination rates and belief in one’s ability (self-efficacy) to receive the vaccine. Among the participants, 247 women were African-Americans, 117 White, and 45 participants were classified as ‘other’. In addition to the main aim, the study examined the effect of perceived seriousness of the disease in vaccination decision making. Findings suggested a positive association of vaccination intentions with higher perception of seriousness for both HPV related diseases (OR = 1.66, 95% CI 1.33 – 2.09, \( P = <0.05 \)) and the likelihood of contracting HPV infection (OR = 1.38, 95% CI 1.10 – 1.72, \( P = <0.05 \)).

A randomized controlled trial combined with a comparative cross-sectional descriptive survey was conducted to assess the effect of written educational materials on parental acceptance of HPV vaccination and to envisage independent predictors leading to HPV vaccination acceptance among parents from three suburban Seattle counties (Dempsey, Zimet, Davis, & Koutsky 2006). Among the 1600 selected parents of eight to twelve-year-old children, 840 self-reported surveys were completed and returned. The participants’ ethnic/racial makeup included: White 76.55%, African American 4.75%,
Asians 11.02%, Latino 3.8%, and others 3.88%. In contrast to the Kahn et al (2008) study, the results suggest a weak connection between increased perceptions of seriousness to increased intentions to vaccinate. The researchers postulated that the 67 item survey used had addressed various constructs of the health belief model and normative beliefs, but had unacceptably low levels of internal reliability for the perceived seriousness construct (coefficient $\alpha = 0.20$) which might have contributed to the weak connection.

A cross-sectional descriptive survey of 60 adolescent and young adult women, 96.7% White and 3.3% African Americans, was conducted in an urban setting in southern New Jersey to determine the perception of seriousness of HPV infection well before the debut of the HPV vaccine (Hoover, Carfioli, & Moench, 2000). This study, which examined the perception of embarrassment related to genital warts, found a positive association ($52\%, P < 0.05$) between perceived seriousness related to HPV and cervical cancer and intention to vaccinate (Hoover et al., 2000). A majority (83.2%) of women reported that they would prefer a vaccine that would prevent genital warts even if the coverage of high risk-HPV vaccination is decreased for this purpose. The researchers concluded that the difference in perception of seriousness between high-risk (cancer precursor) and low-risk (genital warts precursor) HPV strains is most likely related to the difference in external appearance. When compared to genital warts, cancer producing strains do not cause changes that are visible to naked eye and may appear less threatening.

The role of the perception of seriousness in HPV vaccination was further studied by Dempsey, Abraham, Dalton, and Ruffin (2009) in a grounded theory study of 52
mothers (33 who had accepted the vaccine and 19 had declined the vaccine) using a 12-item structured telephone interview. The participants were recruited from urban family medicine or pediatric clinics belonging to the University of Michigan Healthcare system. The main purpose of the study was to evaluate why mothers do or do not vaccinate their adolescent daughters against HPV. Mothers of girls between 11 years and 17 years who presented to primary care clinics for preventative care were recruited for an audiotaped, structured, telephone interview. The findings suggest that one of the most common reasons to decline vaccination is a perception that HPV is a low risk disease; in other words, the low perception of seriousness of HPV can lead to declining the vaccination.

Even though not specific to HPV, findings from a cross sectional descriptive study involving 320 parents and their adolescent children to examine parental attitudes about vaccinating adolescent children against STIs suggested that the perceived seriousness of infection and efficacy of vaccination were the strongest predictors of vaccination acceptance (Zimet, 2005). The participants recruited from the waiting rooms of primary care clinics and pediatric private practices, included 93.1% females, 59.7% Caucasians, 36.3% African-American, and 4% ‘other’ ethnic group. They were asked about the acceptability of vaccine/vaccines against gonorrhea, genital herpes and HIV. Perceived seriousness was measured from physical and emotional perspectives in this study. The study findings suggest that higher perceived physical seriousness (OR = 1.52, 95% CI = 1.08 – 2.12, \( P = <0.05 \)) and higher perceived emotional seriousness (OR = 1.64, 95% CI = 1.15 – 2.34, \( P = <0.05 \)) predicted a stronger likelihood to vaccinate (Zimet et al., 2005).
In an ethnographic study focusing on hypothetical availability of a vaccination against four different STIs: genital herpes, HIV, HPV, and gonorrhea among 34 parents in a Midwestern metropolitan community where 24 of the participants were White and 10 were African-Americans, and 29 were females and five were males, it was interesting to note that vaccination against HIV was the most acceptable (91%) vaccination (Mays, Sturm, & Zimet, 2004). The researchers suggested that perceived seriousness of HIV diagnosis is most likely the reason for this outcome. Perceived seriousness was expressed by statements such as “because there is no cure for it. I know if you get AIDS, you die” by participating parents.

A cross-sectional descriptive study of 889 participants in an urban setting included 624 (70.2%) White, 206 (23.1%) African-American and 59 (6.6%) ‘Others’ that examined the correlates of HPV vaccine initiation. Perceived seriousness of the disease appeared to have no influence on vaccination initiation (Reiter, Brewer, Gottlieb, McRee, & Smith, 2009). It is important to note that the authors caution against considering this conclusion as final because a large majority of parents (96% of participants) responded that they believed cervical cancer was either ‘extremely serious’ or ‘very serious’ causing a lack of variation in response. The study was conducted in five counties of North Carolina where there were higher rates of cervical cancer compared to national rates. The majority of the available literature, with the exception of two studies, found that perceived seriousness is a major factor affecting HPV vaccination acceptance, and that higher perceived seriousness of the disease was directly related to higher vaccination acceptance.
2. 8.b Perceived Susceptibility. Perceived susceptibility is a belief that one might actually acquire the infection. Hence when there are higher rates of perceived susceptibility, the HBM model predicts higher likelihood of accepting or adopting the health promoting behavior. There were at least 11 studies that examined perceived susceptibility as a determining factor for HPV vaccination acceptance.

In a cross-sectional descriptive study of 889 participants that included 70.2% White parents, 23.1% African American parents, and 6.6% ‘others’ parents in an urban setting, findings indicated a significant correlation between perceived susceptibility or likelihood of being exposed to a cancer producing agent and HPV vaccination rates (Reiter et al., 2009). Study findings suggest that when there is increased perception of likelihood of exposure to a cancer producing agent, the vaccination acceptance rates increase (OR = 2.46, \( P < 0.01 \)). It is also important to note that the authors examined the difference in this belief among parents who already vaccinated their children compared to those who were hesitant to initiate vaccination. Parents whose daughters had already received the HPV vaccine had a lower risk perception of acquiring cervical cancer.

In a randomized controlled trial of 840 parents in an urban setting where educational leaflets were used as the intervention, the HBM model was applied with an aim to determine independent predictors of HPV vaccination acceptance among parents (Dempsey et al., 2006). The participants’ ethnic/racial makeup was as follows: White 76.55%, African American 4.75%, Asians 11.02%, Latino 3.8%, and others 3.88%. While the treatment group received information on HPV infection, the control group did not receive any information on HPV. Findings suggest that parents’ belief in their child’s
susceptibility to STIs and/or HPV infection were independent characteristics that
determined increased acceptance of the vaccine ($\beta = 0.17$, $P < .001$). The researchers
concluded that perceived susceptibility was a major factor among six characteristics that
were statistically significant in HPV vaccination acceptance.

In a cross sectional descriptive study of 684 mothers of eight to fourteen year-old
school girls chosen from 10 schools (including primary and secondary schools) from four
different areas of England prior to the debut of vaccination, findings suggest that
increased perception of susceptibility to the infection (OR = 1.27 95% CI = 1.14 – 1.40 $P$
= < 0.0001) was associated with higher vaccine acceptance (Marlow et al., 2007).
Approximately 92.6% of the participants were White, 6.3% were Non-White, and 1.2%
belonged to undisclosed race.

In an ethnographic qualitative study focusing on hypothetical availability of a
vaccination against four different STIs: genital herpes, HIV, HPV, and gonorrhea among
34 parents conducted by Mays et al (2004) in a Midwestern community, findings suggest
that parental refusal of the vaccines were attributed to the perception that their child was
at low-risk to contract an STI (80% of those who refused), and lack of awareness about
disease characteristics (30% of those who refused).

There was one study that specifically stated that despite increased cervical cancer
rates in the southern states of the US, more studies have been conducted in other
geographical regions (Fazekas, Brewer, & Smith, 2008). In order to bridge this gap and to
understand the predictors of HPV vaccination acceptability, Fazekas and colleagues
conducted a descriptive cross-sectional study of 146 southern rural women and their
young daughters using questionnaires designed to capture predictors of HPV vaccine
acceptability (2008). The participants were recruited from two women’s health services clinics in Person County, NC. The majority (62%) of the respondents were African-Americans. The findings suggest that women who expressed higher perceived susceptibility of their adolescent daughters’ likelihood of contracting HPV infection ($\beta = 0.23, P = < 0.01$)) and cervical cancer ($\beta = 0.16, P = < 0.01$) had higher intentions to vaccinate.

In a cross-sectional population based descriptive study of 317 urban and suburban parents of 11 to 12 year-old students in Manchester, UK, to determine parental attitudes towards HPV vaccination among a diverse ethnic and racial populace in the area, findings suggest that parental worries about susceptibility was a good predictor (OR = 7.9, 95% CI = 2.0 - 31.3, $P = 0.001$) of vaccination intentions (Brabin, Roberts, Farzaneh, & Kitchener, 2006). The ethnic makeup of the participants was as follows: White 207 (67.38%), Black-Caribbean 25 (8.19%), Black-African 28 (8.92%), Indian 39 (13.6%), and ‘others’ 5 (1.68%).

While there are studies that did not directly assess the construct of perceived susceptibility, the construct was captured in some of those studies as a secondary finding. In a randomized controlled trial of 243 female undergraduate students from a Southeastern university, Gerend, Shepherd, and Monday (2008) examined the effect of message framing on vaccination acceptance. The researchers were examining if the popular notion that gain-framed messages are more effective than loss-framed messages to encourage adoption of preventive health measures. The majority of the participants were White (76%), followed by African Americans (13%), Asians, (2%), Hawaiian or Pacific Islander (<1%) and 8% of mixed or other. It is interesting to note that while
examining the effect of message-framing in HPV vaccine acceptability, as a secondary finding, the positive effect of higher susceptibility perception on intention to vaccinate \( \beta = 0.25, t [225] = 4.78, \ P < 0.001, \ \text{partial} \ r =0.30 \) became evident.

In a descriptive cross-sectional study using a survey method, conducted in two southern Florida universities among 124 participants, which examined the beliefs, knowledge, and awareness among young adults regarding HPV related risks, the findings suggest that participants expressed a high concern about the relationship between susceptibility to acquire HPV infection and sexual activity \( \beta = 0.24, \ \text{ } P <0.05 \) and number of partners \( \beta = 0.19, \ P <0.05 \) (Gerend & Magloire, 2008). The majority of participants were African-Americans (57%) followed by Caucasians (32%), 5% biracial and 3% each of Asians and Latinos.

In a grounded theory study using focus groups and individual interviews to obtain in-depth information about factors that affect parental acceptance of HPV vaccine by recruiting participants from an urban academic setting clinic and a suburban private practice, findings suggest that parents with increased concerns about perceived susceptibility of their children acquiring HPV were more likely to vaccinate (Olshen, Woods, Austin, Luskin, & Bauchner, 2005). Researchers used a convenience sample of 25 parents and used the HBM as the theoretical framework. Of the 25 parents, 11 participants were White, seven were African-Americans, four were Hispanic and two belonged to ‘the other’ category.

While examining the correlates of parental acceptability of HPV vaccination, researchers in England found that greater concern about contracting HPV (perceived susceptibility) increased vaccination acceptance (Visser & McDonnell, 2008). The
researchers employed a cross-sectional descriptive study approach using a self-administered questionnaire to obtain the data from a convenience sample of 353 parents living in Brighton and Hove. The mean acceptability of HPV vaccination, was higher for girls (OR = 5.27, 95% CI = 5.07 – 5.48) than boys (OR = 5.14, 95% CI = 4.95 – 5.33). Bivariate analysis found significant correlations between a variety of factors and HPV vaccine acceptability, including perception/concern about susceptibility to the disease ($r = 0.26, P = < 0.01$).

Finally, the purpose of the last study reviewed on perceived susceptibility was to determine mothers’ intentions to obtain HPV vaccination for their daughters using the Theory of Planned Behavior (TPB) (Askelson et al., 2010). It was a descriptive cross-sectional survey, conducted in a rural Midwestern State, which randomly recruited participants with the sample consisting mainly of White women with no significant racial or ethnic diversity. Among the 217 surveys returned that met criteria for analysis, findings suggest more than 75% of the mothers did not believe that their daughters were at risk of contracting HPV (i.e. low perceived susceptibility) despite of the fact that many of them knew someone with HPV/genital warts. Using linear regression models, the findings suggested that mothers accepted the vaccination for their daughters due to positive attitudes ($\beta = 0.61, P = <0.001$) in spite of low perceived susceptibility. The authors postulated that the although the risk of acquiring infection may be poorly understood by general public, the decision to vaccinate may be more dependent on the culture and norms of society.

This section underscores the effect that perceived susceptibility to HPV infection has on HPV vaccination acceptance with higher perceived susceptibility resulting in
higher rates of vaccination acceptance. Even though one study did not make a positive connection between perceived susceptibility and vaccination acceptance, the researchers concluded that poor estimation of susceptibility by general public most likely was the reason.

2. 8c Perceived barriers. Perceived barriers represent the beliefs about the material and psychological costs of taking an action (National Cancer Institute [NCI], 2005, table 2). Perceived barriers can be related to financial implications, concerns about side effects, risks, pain and unpleasantness related to the vaccine. The sexual nature of HPV vaccine may pose unique barriers when compared to other childhood vaccinations. Parental concerns may include fear that vaccinating against an STI may unintentionally encourage their children to be sexually active or may initiate early sexual debut (Gonik, 2006).

In a descriptive cross-sectional survey of 353 parents of school aged children administered in the City of Brighton and Hove in England to determine future acceptance of HPV vaccination for children, findings suggest that parental beliefs that STI vaccines encourage unsafe sexual practices were predictive of negative attitudes (perceived barrier) towards vaccination acceptability among parents of both girls and boys (OR = 3.52, 95% CI = 3.33 – 3.70) (Visser & McDonnell, 2008).

In contrast, mothers’ concerns about the vaccination encouraging early or unsafe sexual activity was unsupported in a descriptive cross-sectional study conducted among 217 participants in a Midwestern State in the U.S. based on the TPB (Askelson et al., 2010). Findings suggest no correlation between concerns about early sexual debut or sexual promiscuity and lower vaccination acceptance.
In addition, a cross-sectional descriptive study examining the effect of information pamphlets on HPV vaccination acceptance among 170 Chinese women in Hong Kong, findings suggest that that providing information had a positive influence ($P = <0.001$) on vaccination acceptability (Chee Chan, Cheung, Lo, & Hung Chung, 2007). After providing information, 52% of women supported HPV vaccination vs 32% agreement prior to reading the pamphlet ($P = <0.001$). The study further supported the hypothesis that parental concerns about the HPV vaccine imparting a false sense of security that can promote unsafe sexual practices among their children may serve as a deterrent in HPV vaccination acceptance. Among the participants, 38 (69%) said fear of early sexual intercourse will prevent them from acceptance of the vaccination ($P = 0.003$) for their daughters.

Safety and discomfort concerns have also been found to be barriers to HPV vaccination. Dempsey et al concluded that decreased vaccine acceptability is directly related to concerns about children experiencing substantial discomfort or harm from the vaccinations (2006). In a descriptive cross-sectional study of 409 participants, recruited from primary care clinics in Cincinnati to determine rates of HPV and attitudes toward HPV vaccination among young women, findings suggest that practical barriers related to vaccination ($OR = 0.58$, 95% CI = 0.45 – 0.76) and safety concerns, including fear of intramuscular injections in general ($OR = 0.57$, 95% CI = 0.44 – 0.73) predicted negative vaccination acceptability (Kahn et al., 2008).

A population based, nationwide cross-sectional descriptive survey conducted in Sweden to determine the association of individual attitudes toward HPV vaccine included 11,187 parents of girls and 2759 parents of boys (Dahlstrom, Tran, Lundholm, Young,
The main concern shared by 90% parents in the study was about the side effects of the HPV vaccine. They indicated if the adverse effects are significant, they would refuse the vaccine for their children. Findings from these studies suggest that perceived barriers can originate from multiple factors such as fear of injections, side effects, concerns about safety, behavioral effects of the vaccination such as early sexual debut or sexual promiscuity, and pain/discomfort related to the vaccine.

2. 8.d Perceived benefits. Perceived benefits of the vaccine is a specific construct of the HBM that predicts parental acceptance of the vaccine in many studies. Perceived benefits is defined as one’s opinion about the positive consequences of embracing a behavior (Allen et al., 2010). Greater belief in the benefits of vaccination ($r = 0.39$, $P < 0.01$) may lower parental reservations about vaccinating their children against HPV (Visser & McDonnell, 2008).

Dempsey et al (2006) in a randomized controlled trial combined with comparative cross-sectional descriptive survey sent out to 1600 parents of children between the age of eight years to twelve years with 840 completed surveys returned to the researchers, specifically examined the perceived benefit construct of the HBM. Parental belief in the benefits of HPV vaccine for their children predicted higher vaccination acceptance ($\beta = 0.08$, $P < 0.001$) and was found to be the most important factor in determining parental acceptance of the vaccine.

A cross-sectional descriptive study conducted among 146 participants recruited from a public health clinic, who completed the survey for this project in rural North Carolina to examine predictors of HPV vaccine acceptability among women for themselves and their daughters concluded that mothers who believed that HPV vaccine is
beneficial (perceived benefit) in preventing cervical cancer were more likely to accept the vaccine for their daughters ($\beta = 0.28, P < 0.001$) (Fazekas et al., 2008). The majority of the participants (62%) were African Americans and the mean age of participants was 42 years.

In a descriptive cross-sectional study among 409 participants in three primary care clinics, findings suggest that perceived benefits related to safety and health protection is a stronger predictor for vaccination acceptance ($OR = 1.23, 95\% CI = 0.79-1.93$) than protection for self and partner. The available evidence suggests that perceived benefits of the vaccination is a strong motivating factor for HPV vaccination acceptance.

**Summary of evidence of the HBM and parental HPV vaccine acceptance**

The HBM model, which utilizes four major constructs of perception: perceived seriousness, perceived susceptibility, perceived barriers, and perceived benefits can be used to explain parental health behaviors surrounding HPV vaccine acceptance for their children. Perceived seriousness can be a motivating factor to adopt preventative actions to avoid contracting HPV not only among parents but also in adolescents and young adults. Conclusions from these HBM studies also suggest that if parents are more concerned about the seriousness of the disease, vaccination acceptance rates increase.

Findings also suggest that perceived likelihood of contracting a disease (perceived susceptibility) is another predictor of vaccination intentions. Further, findings suggest that minority populations who perceived their children were susceptible to HPV were more likely to vaccinate. Only one study, conducted by Askelson et al (2010), concluded that perceived susceptibility did not affect HPV vaccination acceptance, but positive attitudes and normative beliefs did.
Perceived barriers is another construct of HBM that emerged as a good predictor of vaccination intentions. Many researchers have suggested that due to the sexual nature of HPV infection, parents may have increased reservations to vaccinate their children against HPV especially their young children. Perception that vaccinating their children against HPV may encourage children to have an early sexual debut or assume unsafe sexual practices seem to have a strong effect in vaccination refusal (Kahn et al., 2008). In addition to this, factors such as discomfort and pain related to intramuscular injections, side effects, and doubts about the efficacy of the vaccine also seem to have a negative association to vaccination intentions. International studies also supported these conclusions, such as the study in Hong Kong, which suggested that fear of promoting unsafe sexual practices and a false sense of security may deter parents from obtaining HPV vaccination for their children (Chee Chan et al., 2007).

The connection of perceived benefits of the vaccine to vaccination acceptance was specifically examined in some studies (Dempsey et al., 2006; Fazekas et al., 2008; and Kahn et al., 2008). Many of these studies hypothesized that higher perceived benefits would result in higher rates of vaccination acceptance. Almost all these studies concluded that there is either a strong correlation or some correlation between vaccination acceptance and perceived benefits of the vaccine.

2.9 Effect of Ethnicity and Race on HPV Vaccination Acceptance

There have been numerous studies to determine the effect of cultural background and ethnicity on acceptance of HPV vaccinations in general, but no studies could be found that specifically targeted the Asian Indian parents in the United States. Ethnicity and race play an integral part in healthcare decision making. Findings from a study of
Southeast Asians in the United Kingdom (U.K.) concluded that there is considerable
difference in HPV awareness among ethnic minority women compared to White women
(Marlow, 2009). The study had a total of 950 participants of which 750 women
represented various minority ethnic groups such as Indian, Pakistani, Bangladeshi,
Chinese, African, Caribbean, and 200 White women as the comparison group. A cross-
sectional descriptive study design was used in an urban setting that helped to capture the
maximum number of ethnic minority women. Ethnic minorities displayed significantly
less HPV awareness [range 6% (OR = 0.11, \( P = <0.001 \)) to 18% (OR = 0.34, \( P = 0.006 \))] compared to 39% awareness among white women. Further, white women displayed the
highest acceptability rates of HPV vaccination compared to minority women. Among
ethnic minorities, HPV vaccination acceptability ranged from 11% (OR = 0.07, \( P =
<0.001 \)) to 51% (OR = 0.61, \( P = 0.022 \)). Another important factor that came to light
through in this study was that generational differences or language spoken at home did
not significantly affect vaccine acceptability (Marlow et al., 2009).

The role of ethnicity in vaccination acceptance was examined in various studies
conducted in England right before and during the time of the HPV vaccination debut.
Brabin, Roberts, and Kitchner (2007) examined the importance of parental consent to
obtain vaccination from an ethnic and racial viewpoint in a mixed method study,
conducted in the UK. They concluded that there are significant differences among
various ethnic groups. The study was a population-based survey specifically meant to
examine parental attitudes towards HPV vaccination. The participants were parents of
school aged children between 11 and 12 years, based in Manchester. There were a total of
244 parents belonging to different ethnic/racial groups: White 165, Black Caribbean 23,
Black African 18, Indian Subcontinent 28, and ‘others’ 10. In this study, White as well as Black-Caribbean parents supported more autonomy for their children compared to Black African parents and parents from the Indian Subcontinent. White parents (45.5%) and Black Caribbean (39.1%) parents favored HPV vaccination without parental consent while only 27.8% of Black African parents and 28.6% of parents from the Indian subcontinent agreed on vaccination without parental consent \( (P = 0.03) \) (Brabin et al., 2007). Parents who favored HPV vaccination without parental consent expressed the opinion that it is important to protect the children of parents who do not act in the child’s best interest.

Brabin and colleagues (2008) conducted another school-based survey in a prospective cohort study to determine the uptake of the first two doses of HPV vaccine involving 2,817 school girls between the age of 12 years and 13 years from 36 secondary schools in Manchester, England (2008). The study highlighted the effect of race and ethnicity with results suggesting lower uptake in schools with higher ethnic minority populations compared to the majority White population \( (P = <0.001) \).

In a cross sectional descriptive survey study conducted in Birmingham, England, 420 participants belonging to different racial and ethnic groups and social classes were recruited to determine HPV knowledge and attitudes toward vaccination (Walsh, Gera, Shah, Powell, and Wilson, 2008). Racial and ethnic differences were significant for HPV knowledge and attitudes with White parents showing more positive attitudes and knowledge \( (P = 0.006) \) compared to Pakistani, Indian, Black Caribbean, mixed races, Bangladeshi, Chinese, and Black Africans in this study. The researchers further
concluded that the only noteworthy predictor of negative attitude toward HPV vaccination was non-White ethnicity (OR = 2.62, 95% CI = 1.16 to 5.92).

The findings of another cross-sectional descriptive research study undertaken to determine the knowledge and acceptability of HPV vaccine among school children and their parents in Birmingham, U.K. that surveyed 434 participants (parents and their daughters aged 11 years to 13 years) also suggest that HPV knowledge is lower among ethnic minority parents compared to White parents (Das et al., 2010). While 72.2% of the participants were White, 5.9% were of mixed race, 17.9% of the participants were Asians, 2.6% Black, and 1.32% Chinese. Among the participants, the mean score for knowledge about HPV vaccination was greater among White participants than participants of ethnic minorities ($P = 0.02$).

Lechuga, Swain, & Weinhardt (2011) conducted a cross-sectional descriptive study involving 150 mothers from public health department clinics in Milwaukee, WI. The purpose of the study was to determine the strongest predictors of mothers’ intentions to vaccinate their daughters among three culturally diverse groups: Hispanic, non-Hispanic White and African Americans. The researchers used message framing (gain or loss) to provide the information to participants. They concluded that among Hispanics, the interaction of ethnicity and social norms more significantly predicted HPV vaccination intention ($r = 0.51, P = <0.05$) compared to African American and White mothers.

In a grounded theory study conducted using a guided interview method in an urban academic medical center and its affiliated community health center, Perkins, Pierre-Joseph, Marquez, Iloka, and Clark (2010) found that ethnicity plays a major role in
parents’ opinion on mandatory HPV vaccine prior to school admission. The participants included 19 Caucasians, 18 African-American, 12 Afro-Caribbean, 3 African, and 21 Latino parents. African-American and Hispanic mothers were more welcoming (78% and 90% respectively) to the idea of mandating the vaccine for school admissions whereas White mothers (11%) had higher reservations and concerns about such mandates ($P = <0.0001$). The White parents’ objection against mandatory vaccination was based on the belief that vaccination decision should be an individual one (Perkins et al., 2010). Ironically, White mothers had higher vaccination rates (100%) for their daughters against HPV despite their opposition to mandatory vaccination programs whereas 90% of African Americans and 73% of Afro-Caribbean/Africans and 90% of Latino mothers had vaccinated their children against HPV ($P = 0.08$). The same study concluded that immigrant parents are more supportive of an HPV vaccine mandate than U.S born parents (78% vs. 51%, $P = 0.01$).

A descriptive cross sectional research study conducted among Californian parents’ examining HPV vaccination acceptance also explored the role of ethnicity and culture in decision making (Constantine & Jerman, 2007). The purpose of this study was to determine parental HPV vaccination intentions for their children in order to guide policy decisions and education. A random digital dial telephone survey method was adapted to recruit participants from all over California. Even though there were 802 participants, a subset of 522 parents who met the criteria were chosen to complete the full survey. Findings suggest that Hispanic parents were more likely (OR = 2.12, $P = .001$) to vaccinate their daughters before the age of 13 years than African-American (OR = 0.46, $P = .03$) and Asian-American (OR = 0.44, $P = .02$) parents.
The available evidence suggests that ethnicity and race play a major role in HPV vaccination acceptance. Even though minority groups such as Hispanic parents and African American parents may welcome measures such as vaccination mandates, the actual intention to vaccinate and acceptance of vaccination at an earlier age is more common among White parents.

2. Effect of Acculturation

Acculturation (cultural identity) is defined as a cultural learning process experienced by individuals who are exposed to a new culture or ethnic group (Sage Publications, n.d. p.102). It has long been understood that acculturation has an effect on healthcare decision making especially among the Asian communities living in the U.S (Zahn, 2003).

A descriptive cross sectional study conducted by recruiting 950 women (White British =200, Indian = 235, Pakistani = 164, Bangladeshi = 63, Caribbean = 130, African = 107, and Chinese = 51) from urban areas of the U.K to determine ethnic differences in HPV awareness and vaccination acceptability concluded that there is no significant difference between first and second generation ethnic minority women in vaccination acceptance (Marlow et al., 2009). Although the researchers stated that generational differences may indicate degree of acculturation, no known acculturation instruments were used in the study to back up this claim. Apart from this single study, there are no other available studies that investigated the effect of acculturation on vaccination acceptance.

Despite the lack of specific studies to determine the effect of acculturation on HPV vaccination acceptance among Asian Indian parents in the United States, available
literature suggests a strong connection between ethnicity and HPV vaccination. It is interesting to note that majority of the studies conducted on the subject internationally and within the U.S concluded that minority populations exhibited a greater likelihood of refusing HPV vaccination. In a descriptive cross-sectional study of 950 participants conducted in England in an urban setting, findings suggest that White women had the best awareness about HPV and vaccination (39%) compared to awareness among ethnic minorities ranging from 6% ($P = <0.001$) to 18% ($P = 0.006$) (Marlow et al, 2009).

Brabin et al (2007) found that compared to White parents, parents from the Indian subcontinent opposed the autonomy of children to make a decision for HPV vaccination. The researchers suggest that degree of acculturation and conservative beliefs might be playing a role in this decision making. Similarly, Walsh and colleagues (2008) concluded that the most significant predictor of a negative attitude towards HPV vaccine is non-White race. Studies to determine HPV knowledge of parents and children also strongly suggested that HPV knowledge is much lower among minority parents and children. The available literature suggests that the effect of acculturation on HPV vaccination acceptance is understudied in the United States as well as in other parts of the world. Hence very little is known about the connection between acculturation and HPV vaccine acceptance even though the effect of ethnicity and race was studied in detail in many research projects.

2.11. Effect of Educational Level on HPV Vaccination Acceptance.

Some studies concluded that parental educational level has an effect on HPV vaccination acceptance. A population based cross sectional descriptive study of 802 participants, conducted in California by using a random-digit-dialing survey to examine
HPV vaccine acceptance among parents, concluded that parents with less than high school education expressed more willingness to vaccinate their daughters before age 13 years against HPV than parents with a graduate degree (unadjusted OR = 2.43, 95% CI = 1.12 – 5.24; OR = 1.10, 95% CI = 0.64 – 1.82) (Constantine & Jerman, 2007).

Participants belonged to two major ethnic groups including Hispanics (38.2%) and non-Hispanic Whites (40.5%).

In a cross-sectional descriptive survey, conducted among 889 parents consisting of 70.2% non-Hispanic White, 23.2% non-Hispanic African Americans, and 6.6% ‘others’, living in counties identified as high risk for cervical cancer in North Carolina to determine the correlates of HPV vaccine initiation, findings suggest that there is borderline association between parental education and vaccination and recommended considering them as additional covariates while employing a multivariate model ($P < 0.10$) (Reiter et al., 2009).

A cross-sectional descriptive study, conducted in Canada by Ogilvie et al. (2007) among 2,083 parents of children eight to eighteen years across Canada with a primary aim to determine factors associated with parental acceptance of HPV vaccine, examined parental educational level as a possible determining factor. Approximately 75% of the participants were females and majority had three or less children. A multivariate analysis of factors associated with vaccination acceptance concluded that parents with higher levels of education were less likely to obtain HPV vaccine for their daughters (63.3% versus 72.9%, $P < 0.01$) (Ogilvie et al., 2007). Findings from studies reviewed suggest that educational level of parents affects HPV vaccination acceptance with higher levels of education correlating with lower acceptance of the vaccine.

A web-based cross-sectional survey involving 476 participants with daughters between the age of nine to seventeen years from three major ethnic/racial groups (White, Black, and Hispanic) in California to determine the role religion plays in HPV vaccine uptake intentions was conducted by Shelton, Snavely, De Jesus, Othus, & Allen (2013). Findings suggest that Catholic parents were more likely to vaccinate their daughters (OR = 3.26, 95% CI = 1.06, 10.06) compared to nonaffiliated parents. Parents who attended religious services on a regular basis were more likely to decide against vaccination than parents who do not regularly attend religious services with the religious denomination making no substantial difference for this variable (OR = 2.92, 95% CI = 1.25, 6.84) (Shelton et al., 2013). Protestant parents were more conservative about vaccinations and preferred vaccinating no one, not just their children.

A similar study through a random-digit-dial telephone survey in California concluded that Catholic parents (84.6%, OR = 2.22, 95% CI 1.40, 3.51, P = 0.001) and parents reporting religious preference as ‘none’ (82.9%, OR = 1.58, 95% CI 0.82 – 3.05, P = 0.017) had increased intentions to vaccinate their daughters at a younger age than other Christian (65.6%, OR = 0.51, 95% CI 0.31 – 0.83 P = 0.006), born-again or Evangelical Christians (63.1%, OR = 0.43, 95% CI = 0.27 – 0.68, P = 0.000). Moreover, parents who attended church services never or rarely were inclined to vaccinate their daughters at a younger age (87.5%, OR = 2.73, 95% CI = 1.53 – 4.76, P = 0.000) compared to those who attended services more than once a week (50.8%, OR = 0.26, 95% CI = 0.15 – 0.46, P = 0.000) (Constantine & Jerman, 2007). The study involved 522 parents belonging to different religious and ethnic groups. Hispanics constituted 38% of
participants while 41% were non-Hispanic Whites. The racial makeup of the rest of the participants is as follows: African-American 6.9%, Asian 7.7% and other 5.4%.

In an attempt to determine parental acceptability of HPV vaccine and physician’s willingness to recommend the vaccination, Barnack, Reddy, and Swain (2010) conducted an online survey that included 100 parents and 100 physicians as participants. They concluded that religious beliefs, perception of their children’s susceptibility to HPV, and perceived negative consequences of the vaccine were strong predictors of parental decision to vaccinate their children against HPV. Parents who never or rarely attended religious services showed the highest intention to vaccinate (mean = 6.22), compared to parents (mean = 5.06) who attended religious services one to three times a month (t = -2.37, P < 0.05) and parents who attended religious services more than once a week displayed the least intention to vaccinate (mean 4.45, t = -3.13, P < 0.01) (Barnack et al., 2010). Findings from studies reviewed suggest that higher religious commitments and increased church attendance among parents correlate with lower HPV vaccine acceptance for their children. On the contrary, at least two studies, concluded that Catholic parents had higher intentions to vaccinate their children against HPV compared to other Christian denominations.

**Summary of Evidence on Ethnicity, Acculturation, Education, and Religion**

There is a substantial body of evidence suggesting variations in HPV vaccination acceptance with regard to ethnicity, educational level, and religious background in the U.S. and worldwide. The effect of acculturation seems to be a variable that is not included in any of these studies.
Available evidence suggests that ethnicity has an effect on HPV vaccination acceptance. Even though ethnic minorities such as Hispanic and African-American parents show more support for mandating the HPV vaccine for young children compared to White parents, the actual acceptance rate of the vaccination was higher among Whites (Perkins & Clark, 2012). Educational level of parents also seems to affect vaccination acceptance where higher parental educational level correlates with lower acceptance of HPV vaccination (Constantine & Jerman, 2007; Reiter et al., 2009).

It is interesting to note that in the United States, parents who identified themselves as religious tend to have more conservative views about vaccination. Further, parents who identified themselves as Evangelical Christians and Born Again Christians as well as parents who attended religious services more often seem to have increased vaccination refusal rates (Shelton et al., 2013). However, almost all studies in the U.S. concluded that Catholic parents and parents who rarely attend religious services accept HPV vaccination for their children more readily. Hence it becomes clear from the available literature that acculturation/ethnicity, educational level of parents, and religion play important roles in parental decision making on HPV vaccination acceptance.

No studies could be identified that specifically targeted the Asian Indian population living in the US. Hence, the effect of any of these variables on HPV vaccination acceptance among Asian Indians is unknown at this time. Subsequently, it becomes clear there is a noteworthy gap in the knowledge about HPV vaccination acceptance among Asian Indian parents.
2.13. Effect of Child’s Gender in HPV Vaccination Acceptance

Child’s gender is another factor that determines vaccination acceptance among many parents. This is evident by the lower vaccination rates for boys compared to girls per CDC vaccination database (CDC, 2012). One possible reason cited by CDC for this difference is due to the early availability of the vaccine for girls while coverage extension to boys occurred a few years later (CDC, 2012).

In a cross-sectional web based study intended to include a nationally representative sample of parents, 1,178 parents of boys were selected to participate in a survey examining parental intentions for male human papillomavirus vaccination (Dempsey, Butchart, Singer, Clark, & Davis, 2011). While 89% agreed on the importance of getting their sons vaccinated against HPV, only 51% intended to vaccinate their sons. The researchers concluded that there is a significant discrepancy between general support for the vaccination and intention to vaccinate sons.

A population based study conducted in Sweden among 16,000 randomly selected parents of girls and 4,000 parents of boys found that that there was no statistically significant difference (OR = 0.98, 95% CI = 0.85,1.13, P = <0.0001) related to gender of the child regarding willingness to vaccinate if the vaccination costs were covered (Dahlstrom et al., 2010). Logistic regression models were used to analyze the data and gender difference of the child was used as an independent variable. An interesting finding was that if the costs were not covered, parents’ willingness to vaccinate was higher for girls than boys (OR = 1.35, 95% CI 1.22, 1.50, P = <0.0001).

A grounded theory study was conducted in Boston using a focus group interview method specifically to determine providers’ attitudes toward vaccinating males versus
females after the vaccine became available for boys. Thirty one family practice providers were recruited to participate in the study including physicians and nurse practitioners (Perkins & Clark, 2012). While 77% of the participants favored vaccinating boys also, only 12% of them offered the vaccination to their male patients. The researchers concluded that one reason for decreased vaccination rates of boys might be due to lack of provider support.

Research evidence suggests that although parents support vaccinating boys against HPV, actual parental intention for HPV vaccination favors girls over boys. Even though child’s gender plays a role in vaccination acceptance, some of the evidence suggests that the discrepancy is due to the later recommendation to offer HPV vaccination to boys. Findings also suggest parents were more hesitant to accept the vaccination for boys if the costs were not covered by insurance. It has been noted that intention to vaccinate may not always equate with actual acceptance of the vaccination.

2. 14. Subjective Norms

Subjective norms can be broadly defined as the “perceived social pressure to perform or not to perform the behavior.” (CHIRr, n.d.). These norms in most cases evolve from one’s belief that an action would be approved by family, peers, and the community. Some studies have specifically examined subjective norms as a possible correlate of HPV vaccine acceptance.

In a cross-sectional descriptive study conducted in Ohio among 409 participants, recruited from three primary care clinics in an urban setting, aiming to examine rates of HPV vaccination, attitudes towards the vaccine, and prevalence of HPV among young women, findings suggest that subjective norms (normative beliefs) have a significantly
positive effect on vaccination acceptance (Unadjusted OR = 2.12, 95% CI = 1.61 – 2.79, 
\(P = < 0.05\)) (Kahn et al., 2008). Among the participants, 78.5% of women were African 
Americans, 14.6% were White, and 6.9% were classified as ‘others’.

Lechuga, Swain, & Weinhardt (2011) conducted a cross-sectional descriptive 
study in an urban setting involving participants from public health department clinics in 
Milwaukee, WI by recruiting 150 mothers to answer questionnaires on intentions to 
vaccinate depending on normative beliefs and personal intentions. The purpose of the 
study was to determine the strongest predictors of mothers’ intentions to vaccinate their 
daughters among three culturally diverse groups: Hispanic, non-Hispanic White, and 
African Americans. Findings suggest that social influences (i.e. subjective norms) are 
significantly associated with \((r = 0.70, P = 0.02)\) in HPV vaccine decision-making among 
Hispanic parents. The researchers suggest that in order to promote HPV vaccination 
acceptance specifically for the Hispanic population, interventions should be based on 
subjective norms rather than attitudes.

A descriptive cross-sectional study conducted by recruiting 541 parents of female 
children between the ages of nine to eighteen years in Brooklyn, New York, to determine 
parental intentions to vaccinate daughters using the HBM as theoretical framework 
examined the effect of subjective norms in vaccination acceptance. Results of this study 
suggest that subjective norms had a significant correlation with acceptance of the vaccine 
\((\beta = 0.122, P = 0.001, 95\% \text{ CI} = 1.030 – 1.238)\) (Reynolds & O’Connell, 2012). The 
researchers report that 78% of the parents were White, 71.7% married, and 63.4% of the 
participants were Catholics. In a survey examining the influence of subjective norms 
among 840 parents of children between the age of eight year to twelve years, findings
suggest that subjective norms significantly predicted vaccination acceptance ($\beta = 0.08, P = 0.004$) (Dempsey et al, 2006).

The few studies that examined subjective norms suggest that it predicts HPV vaccination acceptance among parents in the United States. This means the higher the belief that friends, family, and peers approve the vaccination, the higher the likelihood of parents accepting the vaccine for their children.

2.15. Personal Experience of the Disease

Personal experiences of diseases in general seem to be a strong motivating factor in healthcare decision-making. There are a few studies that examined the effect of personal experience in HPV vaccination acceptance. A randomized controlled trial conducted to determine the effect of written educational materials on parental acceptance of HPV vaccination from three suburban Seattle counties also examined the effect of personal experience of the disease as one of the variables (Dempsey, Zimet, Davis, & Koutsky 2006). Among the 1600 selected parents of eight to twelve-year-old children, 840 self-reported surveys were completed and returned. The participants’ ethnic/racial makeup was as follows: White 76.55%, African American 4.75%, Asians 11.02%, Latino 3.8%, and others 3.88%. Findings suggest that personal history of genital warts predicted increased intentions to vaccinate against HPV ($\beta = 0.05, P = 0.042$).

In a descriptive study of 153 mothers with daughters between the ages of 11 years and 17 years old in a university-based primary care clinic that examined demographics, sexual history, parenting styles and acceptance of HPV vaccination, findings suggest that maternal history of STI was a significant predictor of vaccination acceptance (OR = 3.3, 95% CI = 1.4 – 5.0, $P = < 0.01$) (Rosenthal, Rupp, Zimet, Meza, Loza, Short, & Succop,
2008). The racial make of the participants included 39% African-American, 34% non-Hispanic White, 20% Hispanic, and 7% other.

Lechuga, Swain, & Weinhardt (2011) conducted a cross-sectional descriptive study in an urban setting involving participants from public health department clinics in Milwaukee, WI by recruiting 150 mothers to answer questionnaires on intentions to vaccinate depending on normative beliefs and personal intentions. The researchers concluded that, of the many factors examined, prior experience with HPV is a strong predictor of HPV vaccination acceptance ($r = 0.60$, $P < 0.01$) among African American mothers.

Personal experience can be a motivating factor for parents to obtain HPV vaccination for their children. Because there are no specific studies that solely examined the effect of personal experience of the disease on HPV vaccination decision-making, it is difficult to determine if it is an independent determinant in vaccination decision-making.

2. 16. Asian Indians in the United States

Asian Indians are defined as U.S. citizens or residents whose origins are from the Indian subcontinent and are considered the third largest Asian community in the United States per records from the U.S. census bureau for the year 2010 (Press Trust of India [PTI], 2012). Similar to other Asian ethnic groups, the growth rate of Asian Indians living in the U.S was much higher than the general population growth rate of the United States in the past 10 years. A demographic picture of South Asians in the United States extracted from the 2010 U.S Census by a non-governmental organization shows that the Asian Indian population in the U.S. grew 68% over 2000-2010 from 1.9 million to 3.19 million, representing approximately 1% of the U.S. population (PTI, 2012).
Asian Indians in the U.S. are significantly different from other immigrant groups in that they are usually well-educated, affluent, and English speaking. The 2010, the U.S. Census data indicated that Asian Indians, along with other Asian Americans, have attained the highest educational levels of all ethnic groups in the U.S. Seventy-one percent of all Indians have a bachelor's degree or higher and are economically well-off, with the highest household income of all ethnic groups in the United States (U.S. Census Bureau, 2012b). Unlike many other homogenous immigrants, Asian Indians are highly heterogeneous with diverse ethnicities, languages, religions, dress styles, social habits, cultural practices, festivals, diets and lifestyles. In addition, health knowledge, beliefs and behaviors vary within and between Indian American ethnic groups (Misra et al., 2010).

In India, the concern for the acceptance of HPV vaccination revolves more around associated costs and accessibility, similar to many other recommended vaccinations (Nigam, Saxena, Acharya, Mishra, & Batra, 2014). Some researchers in India, have suggested that cervical cancer screening is probably a more inclusive and cost effective method compared to vaccinating the general population against HPV (Gupta, Kerkar, Dikshit, & Badwe, 2013). This is not very surprising given the state of poor preventive health in India and its status as a developing country. The diversity of culture, religious affiliations, and belief systems can further contribute to large variations on perceptions of the HPV vaccine because Asian Indians living in the U.S have originated from all geographical regions of India.

Asian Indians are a significant minority population in the United States with considerable variations in their culture, values, and belief systems (Misra et al., 2010). Depending on the geographical region they come from, there are wide variations in their
culture and belief systems. Secondary to these variations, healthcare decisions including vaccination acceptance can be very different from the general population in the U.S. Even though relatively well-educated and financially stable, acceptance of HPV vaccination among Asian Indians living in the U.S. is understudied and no relevant research data on HPV vaccination rates is available for this specific population. Studies conducted in India to examine HPV acceptance are based on the economic impact of HPV vaccination rather than factors determining parental acceptance of the vaccine.

2. 17. Asian Indian Parental Acceptance of HPV Vaccine.

Effect of health beliefs. Health beliefs in general play a major role in acceptance of healthcare recommendations including vaccinations aimed at prevention of sexually transmitted diseases (Sturm, Mays, & Zimet, 2005). Furthermore, the possibility of multiple belief factors, cultural variations and personal experiences of the disease may play major roles in the acceptance of HPV vaccination. In spite of the availability of many research studies of the general population, there are no specific studies targeting the Asian Indian population in the United States.

One specific variable (perceived barriers) of the HBM that was assessed under health beliefs was parental belief that the vaccination may encourage early sexual debut or sexual promiscuity (Marlow et al., 2009). This was a cross-sectional descriptive study conducted to determine awareness of HPV and acceptability of HPV vaccination. There were a total of 950 participants with 750 ethnic minority participants and 200 White British women in this study. The researchers concluded that Southeast Asians were more likely to refuse the vaccine due to ‘sexual related reasons’ such as early sexual debut and sexual promiscuity compared to White British Women. Concerns about early sexual
debut and sexual promiscuity were cited as major reasons for vaccination refusal among Asian Indians compared to White British Women (15% versus 2%, $P = < 0.05$).

**Effect of acculturation and educational level.** No studies could be identified in the United States or England that specifically evaluated the effect of acculturation on HPV vaccine acceptance because many of them included ethnicity as a factor rather than acculturation. Similarly, the effect of educational level of Asian Indian parents or Southeast Asian parents on vaccination acceptance was not specifically examined in any of the available studies.

**Effect of religion.** Religion was included as a variable in a few studies conducted in England that included ethnic minorities. Among ethnic minorities in the UK, religion was a significant factor in determining vaccination acceptability and intention to vaccinate (Marlow et al., 2009). This study included 750 ethnic minority women (Indian, Pakistani, Bangladeshi, Caribbean, African, and Chinese) and 200 White women. Among participants, 87% reported some religious affiliation, where the majority were Christian (30%) or Muslim (36%). When compared to non-religious ethnic minorities’ 64%, Hindus had a lower rate of acceptance (34%) and Muslims had the lowest rate of acceptance (18%) ($P = <0.001$).

In a school survey examining parental attitudes about pre-pubertal HPV vaccination, findings suggest (OR = 0.32, 95% CI 0.11, 0.93, $P = 0.04$) that being of ‘other religion’ was associated with lower acceptance compared to being ‘no religion’ (Marlow, Waller, & Wardle, 2007). This study was conducted right around the time when the HPV vaccine became available, with the purpose of determining parental acceptability of HPV vaccine for their young daughters. A school based convenience
sampling method was employed to recruit participants from four different areas of England. There were a total of 1,205 mothers who were categorized as ‘other religion’ and ‘no religion’.

Findings from another study suggested that due to religious beliefs, mothers belonging to the minority groups in the U.K. tend to be conservative about sex outside marriage, thus refusing to vaccinate their children at the recommended age due to beliefs that their children will not engage in premarital sex or sex outside marriage (Marlow, 2011). This belief seems to give them a false sense of security, leading to non-acceptance of the vaccination. Hence, it can be concluded that religion might play a role in HPV vaccination acceptance as evidenced by the findings of these studies.

**Effect of child’s gender.** An international descriptive study published by Paul et al. (2013) examined the of child’s gender on the acceptability of HPV vaccine among parents in India. A total of 18 sets of parents (total 36 individuals) of girls less than 18 years of age were recruited from a village in south India and were personally interviewed by volunteers using a pre-formulated questionnaire. The questionnaire included specifically designed questions to identify factors such as socio-cultural environment, potential barriers, knowledge barriers about the vaccine, and attitude towards HPV immunization. The results indicated that 22 parents had no reservations in accepting the vaccine despite very low knowledge about HPV or the vaccine. Some participants were very specific about the need to vaccinate boys too.

**Effect of Subjective Norms and Personal Experience of the Disease.** The effect of other variables such as subjective norms and personal experience of the disease have not been studied among Southeast Asians or Asian Indians in the U.K or U.S. Absence of
significant studies on this topic targeting the Asian Indian parents in the United States, underscores the need for further research on this population.

2.18. Hepatitis B Vaccine Acceptability

Many of the studies carried out to determine acceptability of the Hepatitis B vaccine were conducted approximately 20 years ago. One such descriptive cross-sectional study examined the strategies to facilitate acceptance of the Hepatitis B vaccine (Rosenthal, Kottenhahn, Biro, & Succop, 1995). The study was conducted in a hospital based clinic and the participants consisted of 80 adolescents and 65 parents. A questionnaire that was designed to capture four aspects of the decision-making process was completed by all participants. It is interesting to note that similar to many other vaccination studies, predictors for parental acceptance of Hepatitis B vaccination mainly included the healthcare provider’s opinion about the vaccine (Wald chi-square = 7.8, \( P = 0.005 \)) and the risks related to the disease (Mantel Haenszel chi-square = 13.2, \( P = 0.001 \)). In addition to these two factors, for the adolescents, parental encouragement to vaccinate (Mantel Haenszel chi-square = 12.9, \( P = < .001 \)) and the belief that ‘everyone is receiving the vaccination’ were strong predictors of intentions to get vaccinated (Rosenthal et al., 1995)

Researchers in Netherlands conducted a descriptive cross-sectional study to examine psychosocial determinants of parents’ intentions to vaccinate children against Hepatitis B (Harmsen et al., 2012). Approximately 2000 parents of children less than two years old were randomly selected from the vaccination registry in the Netherlands to participate in the survey with a return rate of 906 completed surveys. The Theory of Planned Behavior was used as the theoretical background for the study. The study
concluded that majority of parents (89%) desired to vaccinate their children. The principal determinants in decision-making were the perceived benefits of the vaccine and their child’s susceptibility to the disease ($P = < 0.001$) (Harmsen et al., 2012).

Heffernan, Garland, and Kane conducted a systematic analysis (2010) to determine the trends in acceptance of Hepatitis B vaccine over the years. The researchers examined similarities and differences about acceptance of Hepatitis B and HPV vaccine by comparing and contrasting Hepatitis B vaccine challenges to that of HPV vaccination. They identified several factors that contributed to the success of the Hepatitis B vaccination program over the past 15 years. Some of those factors include: (1) the need to involve stakeholders in to account in all aspects of vaccination implementation strategies (2) importance of identifying attributes of the targeted population (3) government support for the program (4) affordability in certain geographical regions and (5) public education programs. The researchers recommended that including HPV vaccine in the infant immunization panel might be the best way to increase vaccination compliance since the uptake of Hepatitis B vaccination increased to present levels after its inclusion in the infant immunization schedule. The findings of these studies indicate that the Hepatitis B vaccination program has been successful and more acceptable than the HPV vaccination program to parents. In the United States, 93% of children between the age group of 19–35 months are vaccinated with all three recommended doses of the Hepatitis B vaccine which is much higher than the HPV vaccination rates (Teen Vaccination Coverage, CDC, 2011).
2. 19. Summary

This chapter reviewed the available research on risks for and epidemiology of HPV acquisition, disease burden of HPV infection and its psychological effects, prevention and rates of HPV vaccination, factors associated with parental acceptance of the HPV vaccine via the Health Belief Model, and effect of ethnicity and race on HPV vaccine acceptance. Additionally, the effects of acculturation, educational status of parents, religion, child’s gender, subjective norms, and personal experience of the disease were also reviewed.

The major identified risk factors for acquiring HPV infection include higher number of sex partners, life time history of sex partners and less than 25 years in age (Winer, Lee, & Hughes, 2003). There are about 14,100,000 new infections annually in the United States with a high prevalence rate of 79,100,000 at any given time (CDC, 2012). HPV infection adds a substantial financial burden to the U.S. healthcare system, costing $ 2.25 billion to $ 4.6 billion annually, related to diagnosis, follow up, and treatments. Among STIs, this treatment cost is second only to HIV.

In addition to financial burden, the psychological effects of the infection were also found to be significant. Emotions of anger, depression, anxiety, low self-esteem, shame, guilt, and social isolation were found to be prevalent following a diagnosis of HPV (Graziottin & Serafini, 2009; Escalas et al., 2009).

The findings reviewed suggest that the only definitive preventive measure is complete abstinence. Long term mutually monogamous sexual relationships with HPV negative partners also may prevent infection (CDC, 2012). The review found that the currently available vaccination against HPV, Gardasil™, is effective against four strains
of HPV that causes the majority of HPV infections in the general population (FDA, n.d). One specific study conducted in Australia applying a mathematical model predicts near elimination of genital warts in Australia after the vaccination was made mandatory for girls (Korostil et al., 2012). The review also found that current HPV vaccination rates in the United States are low with only 37.6% girls and 13.9% boys between the ages of 13 to 17 years receiving all three doses of the vaccine (CDC, 2014).

The review also found that the Health Belief Model (HBM) is an applicable theoretical framework to determine HPV vaccination intentions. A substantial body of evidence was available applying the four constructs of the HBM model as well as the effect of socio-demographic factors in HPV vaccination decision-making. Even with the availability of ample research, the Asian Indian population is an understudied ethnic minority in HPV vaccination acceptance. In addition, international studies have not specifically included this population even though there are some studies in England that targeted ethnic minorities from South East Asia.

Perceived seriousness was recognized as a key factor in majority of the studies except two as a determinant of vaccination acceptance. The positive correlation of perceived seriousness with vaccination acceptance was observed not only among parents, but also among adolescents (Kahn et al., 2008). Some studies have pointed out that perception of seriousness can be related to not just the seriousness of a diagnosis itself, but changes in physical appearance caused by the disease as well (Hoover et al., 2000). Perception of low-risk was consistently associated with reduced HPV vaccination acceptance as evidenced by studies conducted by Dempsey et al (2008). Apprehension about characteristics of a disease, which would also fall in to the ‘perceived seriousness’
category seemed to be a motivating factor to increase vaccination uptake. Perception of risks can include wider variables such as shame, embarrassment, and financial implications.

Perceived susceptibility is a construct that emerged as a strong predictor of vaccination acceptability. This was evident in studies conducted in the U.S. as well as internationally. One major theme that became apparent from many of these studies was that ethnic minorities, especially people belonging to Southeast Asia and Africa have decreased or unrealistic perceptions about their children’s susceptibility to HPV as evidenced by studies conducted by Marlow and colleagues (2009) as well as Brabin et al (2008). Similarly, a study conducted by Askelson et al (2010) concluded that low perceived susceptibility and intention to vaccinate is most likely due to relatively poor understanding of the risk by general public and greatly depends on culture and the norms of the society.

Perceived barriers, which can include any factors that contribute to parents’ belief that the risks of the vaccine outweigh the benefits, was also found to predict HPV acceptance. Available literature suggested that these barriers can include, but are not limited to fear of early sexual debut by children who had the vaccination, adoption of unsafe sexual practices due to false sense of security, doubts about the efficacy of the vaccine, and fear of side effects. Not surprisingly, these barriers were increased (except fear of discomfort and side effects) among minorities in almost all studies that examined this specific variable. The review also found that personal experience and knowledge about a close friend or relative who had the disease may also contribute to parental acceptance of the HPV vaccination.
The review also found that perceived benefits has a positive correlation to HPV vaccination acceptance. Available literature suggests that parents who perceived higher benefits to receiving the vaccination expressed higher acceptance of HPV vaccination.

In addition to health beliefs, ethnicity was identified as a factor affecting HPV vaccination uptake. Studies conducted in England mainly by Marlow et al (2005, 2007 & 2009), Brabin and colleagues (2008), and Lechuga et al (2011) over a time period of about 7 years (from 2005 to 2011) have all concluded that parents from the Southeast Asia had the strongest cultural and ethnic reservations in obtaining HPV vaccination for their children. Most of the U.S studies that examined minority populations such as African Americans, mixed race, Hispanics/Latinos, and Asians for the variable of race and ethnicity suggest that ethnic and racial minorities have increased reservations about vaccinating their children against HPV.

Lack of studies about the effect of acculturation on acceptance of the vaccine further underscores the need for more studies. Educational status of parents seemed to be another factor determining HPV vaccination acceptance. Parents with lower levels of education had higher rates of vaccination acceptance (Constantine & Jerman, 2007; Reiter et al., 2009; Oglivie et al., 2007).

Many of the US studies concluded that Catholic parents and parents who attended religious services less frequently have increased intentions to vaccinate their children against HPV. Shelton et al (2013), however, concluded that US parents who identified themselves as Evangelical or born-again Christians or attended regular religious services tend to oppose vaccinating not only their children, but the general population as well. Some of the studies conducted in England portrayed the effect of religion in varying
degrees on the acceptance rates of vaccination with Christians exhibiting the least hostility towards the vaccination (Marlow et al., 2007; Brabin et al., 2006).

Effect of child’s gender was examined in a few studies concluding that generally parents tend to accept HPV vaccination more readily for their daughters compared to sons (Paul et al., 2013). This may be attributed to delayed recommendation of the vaccine for boys and even concerns about the costs involved. Subjective norms were also identified as a possible factor with higher beliefs showing a positive correlation to higher acceptance of the vaccination (Reynolds & O’Connell, 2012). Very few studies had examined the effect of personal experience of HPV on vaccination acceptance and concluded that maternal history of the disease may encourage acceptance of the vaccine (Rosenthal et al., 2008).

Existing literature suggests that among general population, the Hepatitis B vaccine, which is also a three-dose vaccination against a disease considered sexually transmitted, has a higher acceptance rate when compared to the HPV vaccine. The major reason attributed to improved Hepatitis B vaccine uptake among parents seems to stem from its mandatory status for infants (Heffernan et al., 2010). There may be lessons that can be learned from the success of the hepatitis B vaccination program to remove acceptance barriers and improve current HPV vaccination rates.

Despite available research on the general population, lack of research studies on HPV vaccination intentions among Asian Indians in the U.S. makes it difficult to infer the factors that would improve vaccination acceptance in this population. By applying the four constructs of HBM, further insight could be gained regarding the factors that determine vaccination acceptance among Asian Indian parents in the United States. Even
though the findings of the studies that aimed general population in the U.S. cannot be
generalized to Asian Indians, many of these factors may play major roles in HPV
vaccination acceptance in this population. Thus, since there were no studies (prior to the
current study) that examined HPV vaccination acceptance among Asian Indian parents in
the U.S. and the effect of factors such as health beliefs, acculturation, education, religion, child’s gender, subjective norms and personal experience of the disease, there was a need
to further examine the connection between these factors and HPV vaccination
acceptance. This study may facilitate development of interventions to improve
acceptance rates among this Asian Indian parents in the U.S.
Chapter 3 Research Design and Methodology

This chapter presents the methodology that was used for the study including the research design, population and sample, sampling methods, instruments, data collection procedure, and analysis of the data that was used in comparing the rates of HPV vs. Hepatitis B vaccine acceptance, and predicting effects of health beliefs and acculturation on HPV vaccine acceptance among Asian Indian parents. This study also explored the secondary aims including the effect of educational level of the parents, religion, child’s gender, subjective norms, and personal experience of the disease on HPV vaccination acceptance among Asian Indian parents.

3.1. Research Design

A descriptive comparative cross-sectional design was used to compare the rates of HPV vs. Hepatitis B vaccine acceptance, and to predict the effects of health beliefs and acculturation on HPV vaccine acceptance among Asian Indian parents. This design was specifically chosen for the study because it was expected to be instrumental in describing the characteristics associated with lower HPV vaccination acceptance rates.

3.2. Population and Sample

The population for this specific study was Asian Indian parents living in the United States who had children between nine years and sixteen years old. Most of the study sample was drawn from the Houston metropolitan area in Houston, Texas. According to a published report, of the 6.02% of Asian population living in the Houston area, 20.8% people are of Asian Indian origin (Population and Races, 2010). Additional participants were drawn from other parts of the United States via email. Asian Indians at 3.2 million, form the 3rd largest Asian community in the United States and about 55% of
this population live in five States: California, New York, New Jersey, Texas, and Illinois (2010 Census Briefs, 2012). The same report identifies that the metropolitan cities in these states have the highest concentration of Asian Indians. So, the PI actively recruited Asian Indian parents from other metropolitan areas as well as from all over the United States.

3.3. Sampling Methods and Recruitment

Participants were recruited by two methods of sampling: convenience and snowballing, from a variety of community sites in Houston including Asian Indian associations and cultural organizations. In addition, participants were recruited from local Hindu Temples, Christian churches, and Muslim mosques where Asian Indian families attend and worship on a regular basis.

Recruitment methods included live information presentations as well as email and social media invitations. The Principal Investigator (PI) provided a short presentation about the goals and purposes of the research to local Asian Indian religious leaders and officials of these cultural and religious organizations in Houston so that they could inform potential participants about the study. In addition, permission letters from these leaders were obtained to allow the PI to approach their members face-to-face and electronically. Finally, a study flyer was attached to emails and social media to inform potential Asian Indian participants in Houston as well as those across the United States about the details of the study. The inclusion and exclusion criteria for subject participation are listed below:
Inclusion Criteria

1. Asian Indian parents with at least one child between nine and sixteen years old
2. Self-identification as Asian Indian.
3. Asian Indian parents who consented to the study
4. Asian Indian parents who currently lived in the United States

Exclusion Criteria

1. Asian Indian parents who lived in the U.S, but sent children to schools back in India
2. Asian Indian Parents who did not have children between nine and sixteen years old.
3. Non-Asian Indian parents.
4. Asian Indian parents who were not living in the U.S.

Sample Size Estimation: The sample size needed was calculated based on the primary aim of the research project which is to determine if there was a difference between Hepatitis B vaccination and HPV vaccination acceptance among Asian Indian Parents. As established by previous research on non-Asian Indian parents, the acceptance of at least one dose of HPV vaccination was expected to be 45% and the acceptance of Hepatitis B vaccination was expected to be 90%. Using the above estimates, a sample size of 160 participants was deemed sufficient to achieve 81% power to detect a difference between group proportions of 0.45 with a significance level (alpha) of 0.05 using a two-sided two-dependent group McNemar \( \chi^2 \) test. The same sample size was also estimated to be sufficient for logistic regression analysis to achieve 81% power, 0.05
alpha, and a 1.65 Odds Ratio. The expected survey response rate was about 50%, based on a meta-analysis conducted to examine variations in response rates to email surveys (Sheehan & McMillan, n.d.). Therefore the PI actively tried to recruit as many people as possible to meet the minimum requirement of 160 participants.

3.4. Instruments

The survey instruments collected data on demographics, health beliefs and acculturation, subjective norms, and personal experience of the disease. The purpose of collecting demographic data was to describe the study sample as well as to inform the secondary aims of the study to explore the effects of educational level, religion, personal experience of the disease and child’s gender on HPV vaccination acceptance. In addition to these demographics, data also included age, marital status, income, health insurance status, as well as the number, sex, and age of children. In the same section, in addition to the demographic questions, questions to assess the status of Hepatitis B and HPV vaccination of children (boys and girls) were asked. If the children were not vaccinated against HPV yet, two further questions were included to assess the intentions to vaccinate as well as their perception of appropriate age for the vaccination. Two instruments (described below) were incorporated into the survey to collect data on health beliefs and acculturation.

3.4. a. The Health Beliefs Instrument. Health beliefs and subjective norms were measured by a 51-item six-point Likert scale instrument developed by Reynolds and O’Connell (2012), by combining two previously known instruments designed to assess parental HPV vaccination acceptance rates. The tool incorporated 30 items from a 67-item survey developed by Dempsey and colleagues (2006) to assess how parents feel
about new vaccines and factors predictive of parental vaccination acceptance for their children, plus 21 items from a 108-item survey developed by Marlow et al (2007) to determine parental attitudes towards pre-pubertal HPV vaccination.

The original tool from Dempsey et al. (2006) assessed various factors that determine acceptance of vaccination such as attitudes about vaccinations, HPV and sexually transmitted infections (STIs), socio-demographic factors, HPV knowledge, and personal experience with STIs and HPV (Dempsey et al., 2006). Attitudes towards the vaccination were assessed by questions on five psychological concepts based on the Health Belief Model (HBM) and Theory of Reasoned Action (TRA); with four of these constructs originating from the HBM and one from the TRA. The construct of perceived seriousness was assessed by three items, perceived susceptibility by three items, perceived barriers by four items, and perceived benefits by three items. Normative beliefs based on the TRA were measured by two items to measure how parents are affected by parental peer preferences and the child’s physician’s recommendations. The three constructs of the HBM, perceived susceptibility, perceived benefits, and perceived barriers in this scale had high internal consistency with a Cronbach coefficient alpha ranging from 0.68 to 0.78. The construct of perceived seriousness and normative beliefs (originated from TRA), however, had lower Cronbach scores as evidenced by coefficient α of 0.20 and 0.27 respectively (Dempsey et al., 2006). This flaw in the Dempsey instrument was rectified when Reynolds and O’Connell combined it with the items from the Marlow instrument (discussed below).

The 21 items utilized by Reynolds and O’Connell (2012) from the original 108-item survey developed by Marlow et al (2007) was also based on the HBM. This tool
assessed parental perceptions of the (1) importance of vaccinations, (2) general trust in physicians and government, (3) perceived susceptibility to HPV, (4) perceived seriousness of HPV (5) perceived susceptibility to cervical cancer, (6) perceived seriousness of cervical cancer, (7) and HPV knowledge (Marlow et al., 2007). The reported Cronbach’s alpha for the scales included: severity of HPV ($\alpha = 0.83$), severity of cervical cancer ($\alpha = 0.74$), susceptibility to HPV ($\alpha = 0.80$), and susceptibility to cervical cancer ($\alpha = 0.59$).

The final questionnaire developed by Reynolds and O’Connell (2012) from the Dempsey et al (2006) and Marlow et al (2007) scales contains seven distinct subscales addressing the four constructs of HBM as well as the construct of subjective norms. This tool contains six items to measure perceived seriousness, eight items to measure perceived susceptibility, eight items to measure perceived barriers, three items to measure perceived benefits and one item to measure subjective norms. Questions to assess the four HBM constructs used a five-point Likert scale response ranging from ‘strongly disagree’, ‘disagree’, ‘neutral’, ‘agree’, to ‘strongly disagree’. The numerical scores for these responses range from one to five (‘strongly disagree = 1’ and ‘strongly agree =5’). The final score for each construct is obtained from adding up all the scores pertaining to each construct and then dividing it by the number of variables included in each construct to get a mean score. The higher the mean score, the higher the perceived seriousness, perceived susceptibility, perceived barriers, and perceived benefits. Questions for assessing the subjective norms also used a Likert scale (five-point) with points ranging from ‘not important at all’, ‘somewhat unimportant’, ‘not sure’, ‘somewhat important’, and ‘extremely important’. Similar to health beliefs, the responses
carry numerical scores ranging from zero to four (not important at all =0, somewhat unimportant = 1, not sure = 2, somewhat important =3, and extremely important =4). The scores were summed up and then divided by five to get a mean score with higher scores representing higher subjective norms (Reynolds & O’Connell, 2012).

The internal consistency of the scales was calculated by factor analysis of the principal components (Reynolds & O’Connell, 2012). Cronbach’s alphas of the first two HBM constructs include perceived seriousness (α = 0.82), and perceived susceptibility (α = 0.83). The researchers found that for the third HBM construct of perceived barriers, sexual disinhibition was a standout characteristic and they separated the three questions on sexual disinhibition from other perceived barriers questions and analyzed them separately. This perceived barrier subscale regarding sexual inhibition had a high internal consistency (α = 0.95). The remainder of the perceived barriers questions (five) were grouped under a physical barriers subscale and had a Cronbach’s alpha of α = 0.83. The subjective norms subscale had good internal consistency reliability evidenced by a Cronbach’s alpha of 0.75. Reynolds and O’Connell (2012) did not report the internal reliability for the fourth HBM construct, perceived benefits, instead relied on the internal reliability reported from the original tools they adapted.

This scale was developed by Suinn, Ahuna, and Khoo (1992) to measure acculturation of Asian-American clients. The main purpose of the scale was to assess the levels of acculturation of Asian Americans and was tested among various Asian American subgroups (Chen, Juon, & Lee, 2012). While there is a modified 26-item SL-ASIA five-point Likert scale, for the purpose of determining the effect of acculturation on HPV
vaccination acceptance among Asian Indians, the original 21-item five-point Likert scale was used because it addresses the acculturation variables that the PI intended to measure for this study including: ethnic self-identity (four questions), language use (four questions), friendship preferences (four questions), behavior and attitudes (six questions), and generation and geographic history (three questions). The final acculturation score was obtained as a mean score ranging from one to five, with higher scores indicating higher acculturation in Western Society.

The reliability and validity of the SL-ASIA scale was established in various studies involving the Asian population living in the United States. A study of 324 Asian adults reported an internal consistency of 0.88 to 0.91 (Suinn, Ahuna, & Khoo, 1992). It is interesting to note that the scale consistently exhibited higher scores (higher levels of acculturation) for individuals of Asian origin who attended schools in the United States for longer periods of time, and those who lived longer in the US. Another study of 342 Asian Americans to determine the validity of three different Asian American multidimensional acculturation scales found that average ratings across the 21 items had a calculated coefficient alpha of 0.84 (Gim Chung, Kim, & Abreu, 2004).

A third cross sectional research study including 2,830 participants that utilized the SL-ASIA scale to determine the effect of acculturation in smoking initiation among Californians of Korean descent reported a Cronbach alpha of 0.90 (Hofstetter et al., 2007). Finally, a cross-cultural examination of Asian acculturation study that included 284 Asian American students in the U.S and 118 Asians living in Singapore using the SL-ASIA scale found a Cronbach alpha of 0.79 (Suinn, Khoo, & Ahuna, 1995).
Despite the wide use of SL-ASIA scale in studies conducted among Asians living in the United States, the validity and reliability of this tool specific to the Asian Indian population has not been reported. The PI, after careful evaluation of the SL-ASIA tool, determined that three questions to assess the ethnic self-identity of the participant would need very minor wording revision in one of the five response options to better conform to the population of interest. For questions three, four, and five, the fourth response option in the scale will have the words “Asian-Indian” added to the already existing words: “Chinese-American, Japanese-American, Korean-American, etc.” A Cronbach’s alpha is reported for this subscale in Chapter 4.

In addition to the two scales and the demographic data, the survey had five open-ended questions that were analyzed using content analysis. These questions were added with an expectation that the survey would capture further information than the structured questionnaire thus enhancing more in-depth understanding of why Asian Indian parents choose to vaccinate or not vaccinate their children against HPV.

3.5. Data Collection Procedures

Approval for the study was obtained from Drexel University’s Institutional Review Board (IRB) as well the University of Texas Health Science Center at Houston (UTHHealth-Houston) IRB since the PI is an employee at UT Health-Houston. All participants received informed consent prior to data collection.

Paper and electronic forms of the survey were made available in the local study sites. Even though electronic mode of completion was preferred, for participants who favored to complete a paper format, paper and pencil version of the survey was provided which also included a written informed consent. There were 18 completed paper and
pencil surveys and to ensure accuracy of the data entered, the PI entered the data twice and compared entries, and a faculty member from the University of Texas Houston, also checked the entries. Participants who chose electronic access were instructed via email and social media to click on the study survey web-link. Before accessing the survey, participants were directed to an electronic consent, where they were informed that clicking on the study survey web-link indicated that they consented to participate in the study. The total time estimated to complete the survey was expected to be between 15 to 20 minutes. The data collection did span over six weeks and this time period was adopted based on recommendations for online survey response rates (Hamilton, 2009). This meta-data analysis suggested that 96.5% of responses come within the first two weeks once the survey is launched. Participants who were willing to share their email addresses after completion of the questionnaire were offered a chance to enter a lucky draw for one of the three gift cards (one gift card worth $50.00 and two gift cards worth $25.00 each). No personal identifying information was collected from the participants, other than collecting email addresses from those who wished to participate in the lucky draw.

3.6 Data Analysis

Data was entered directly to SPSS, cleaned, coded, and checked for shape of distribution and outliers, and then analyzed using descriptive statistics. The criterion for significance (alpha) had been set at 0.05. The original plan to handle missing data was with the multiple imputation method, where missing values are replaced with a set of plausible values based on uncertainty of the correct value, analyzed with standard procedures for complete data, and then combining the results of these analyses (Yuan, n.d). Since missing data was very minimal, list-wise deletion was used instead of multiple
imputation. One participant missed all questions about health beliefs and four other participants missed one to three random questions. Hence, it was concluded that missing data is not significant enough to cause substantial variations in the results. Despite collecting HPV and Hepatitis B vaccination data for all children between the age group of nine to sixteen, as some families had more than one child in the specific age group (9-16 years), the vaccination details of the youngest child from each family was utilized for analyzing the data, to avoid any bias.

**Primary Aim 1.** In order to address the primary aim one, to determine if there was a difference in HPV vaccine acceptance compared to Hepatitis B vaccine acceptance among Asian Indian parents, the rates of HPV vaccination acceptance was compared to Hepatitis B vaccination acceptance using a two-sided two dependent group McNemar Chi square test.

**Primary Aim 2.** To determine the effects of health beliefs on vaccination acceptance among Asian Indian parents, a hierarchical logistic regression model was used. Educational level, religion, child’s gender were added as co-variates in the first step; subjective norms, (peer, family, and social pressure), and personal experience of the disease were added as co-variates in the second step, and health beliefs were added in the third step of the logistic regression model.

**Primary Aim 3.** To determine the effects of acculturation on vaccination acceptance among Asian Indian parents, a hierarchical logistic regression model was used. Educational level, religion, and child’s gender were added as co-variates in the first step; subjective norms, (peer, family, and social pressure), and personal experience of the
disease were added as co-variates in the second step, and acculturation was added in the third step of the logistic regression model.

3.7. Human Subjects

**Risks.** IRB approval was obtained from the parent institution as well as the institution where the PI is employed, to protect human subjects. No apparent risk was foreseen with this study since it was not an interventional study. The parents voluntarily completed the survey after informed consent that explained the purpose of the study, possible risks and how the data would be utilized. Parents had complete freedom to make a decision whether or not to enter the study, and to complete it. Extra precautions were taken to ensure anonymity of the participants and the information they provided through the survey. IP addresses of the participants were not collected. All the completed and attempted paper surveys were kept in a locked cabinet accessible only to the PI and will be destroyed three years after the completion of the study. Data collected from this study will be published or presented only as grouped data rather than individual level data. Even though women were included in this study, due to the nature of the study that involved completion of a non-experimental survey, no specific risk to this population was anticipated. This study did not directly involve children or vertebrate animals.

**Benefits.** While there were no specific benefits to individual participants, it was expected that parents may learn new and interesting information about HPV and available vaccination. The parents might also be motivated to find out more about the advantages and disadvantages of obtaining HPV vaccination for their children.
Compensation. Participants who were willing to share their email addresses after completion of the survey were offered a chance to enter a lucky draw for one of the three gift cards (one gift card worth $50.00 and two gift cards worth $25.00 each).
Chapter 4: Results

This chapter presents the results of the current study where the aims were to determine among Asian Indian parents if: (1) there was a difference in HPV vaccine acceptance compared to Hepatitis B vaccine acceptance, (2) health beliefs (perceived seriousness, susceptibility, barriers, and benefits) predicted HPV vaccination acceptance, and (3) acculturation predicted HPV vaccination acceptance. Additionally, secondary predictors of HPV vaccine acceptance were explored including: parental educational level, religion, gender of the child, subjective norms (parental peer, family, and societal influence), and personal experience of the disease to assess if they were associated with or had an effect on HPV vaccination acceptance. Prior to any testing, the data was directly entered into SPSS, cleaned, coded, and checked for shape of distribution and outliers. Although the original plan was to handle missing data with multiple imputation, because missing data were very minimal, list-wise deletion was used instead.

Enrollment of Participants

The study was conducted over a period of six weeks from August 16, 2015 to September 27, 2015. Potential participants were contacted directly through the leaders of Asian Indian religious and cultural organizations as well as a survey web-link administered through Qualtrics via email. As detailed in Figure 4.1, a total of 276 participants clicked on the web link, but 29 individuals (10.5%) did not continue with the survey. Of the remaining 247 participants, 28 participants (10.1%) were ineligible due to not consenting to the survey (N = 5), not having children in the specified age group (N = 22), or not living in the United States (N = 1). The total number of participants who consented to the survey was 219 (79.34%). Forty-six (16.67%) of the consented
participants dropped out of the survey, which left a total of 173 (62.68%) participants who completed the survey.

Figure 4.1. Enrolment
Demographic Data – Sample Characteristics

The mean age of the participants was 43.68 years (SD = 5.68) and 65% were females (N = 113) (Table 4.1). The majority of parents, 91.33%, (N = 158) had at least a baccalaureate or a graduate degree. In addition, the majority of the participants (98%, N = 171) were married, with 57% (N = 98) having an annual household income above $100,000. Almost all participants, 98%, (N = 171) had some form of health insurance. For religious affiliation, 67% (N = 113) of participants identified themselves as Christians, followed by 22% of Hindus (N = 38), and 12% of Muslims (N = 20). More than half of the participants (51%, N = 88) reported having one child or two children (39%, N = 67) in the specified age group. There were a total of 168 children belonging to the youngest children category including 97 (57.74%) females. There were a total of 274 children between ages 9-16 years for whom the HPV vaccination status was reported. More than half of the children [55%, (N = 148)] were females (Table 4.1).
Table 4.1. Total Sample – Demographic Characteristics

<table>
<thead>
<tr>
<th>Characteristics/variables</th>
<th>N (%) unless otherwise indicated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent age (years), M(SD)</td>
<td>43.68 (5.68)</td>
</tr>
<tr>
<td>Gender of parents</td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>113 (65%)</td>
</tr>
<tr>
<td>Males</td>
<td>60 (35%)</td>
</tr>
<tr>
<td>Marital status (married)</td>
<td>169 (98%)</td>
</tr>
<tr>
<td>Parent Education</td>
<td></td>
</tr>
<tr>
<td>&lt; HS degree</td>
<td>5 (2.89%)</td>
</tr>
<tr>
<td>HS degree</td>
<td>8 (4.62%)</td>
</tr>
<tr>
<td>Some college</td>
<td>2 (1.16%)</td>
</tr>
<tr>
<td>College degree</td>
<td>59 (34.10%)</td>
</tr>
<tr>
<td>Graduate degree</td>
<td>99 (57.23%)</td>
</tr>
<tr>
<td>Annual Household Income</td>
<td></td>
</tr>
<tr>
<td>&lt; 50,000</td>
<td>7 (4%)</td>
</tr>
<tr>
<td>50,000 to &lt; 75,000</td>
<td>22 (13%)</td>
</tr>
<tr>
<td>75,000 to &lt; 100,000</td>
<td>46 (27%)</td>
</tr>
<tr>
<td>100,00 to &lt; 125,000</td>
<td>31 (18%)</td>
</tr>
<tr>
<td>125,000 to &lt; 150,000</td>
<td>22 (13%)</td>
</tr>
<tr>
<td>150,000 or more</td>
<td>45 (26%)</td>
</tr>
<tr>
<td>Religion</td>
<td></td>
</tr>
<tr>
<td>Christian</td>
<td>113 (65%)</td>
</tr>
<tr>
<td>Hindu</td>
<td>38 (22%)</td>
</tr>
<tr>
<td>Muslim</td>
<td>20 (12%)</td>
</tr>
<tr>
<td>Others</td>
<td>2 (1%)</td>
</tr>
<tr>
<td>Health Insurance (yes)</td>
<td>171 (98%)</td>
</tr>
<tr>
<td>Gender of children (female)</td>
<td>148 (55%)</td>
</tr>
<tr>
<td>Gender of the youngest child (female)</td>
<td>97 (57.74%)</td>
</tr>
</tbody>
</table>

* Total number of participants N =173
† Total number of children N = 271

Youngest Child Analysis

To reduce bias, the vaccination status for the youngest child from each family was included in the remaining data analysis and data analysis of the primary and secondary aims because some families had more than one child in the specified age group (9 -16 years). There were 171 children in the youngest child group because two participants out of the 173 did not report the age for any of their children. Gender was reported for 168
children including 57.74% of females (N = 97). In this group, age was not reported for one child and gender was not reported for three children. Distribution by age and gender is reported in Table 4.2.

Table 4.2. Age and gender of youngest children (Total N = 171)

<table>
<thead>
<tr>
<th>Age</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 year olds</td>
<td>37 (21.76%)</td>
</tr>
<tr>
<td>10 year olds</td>
<td>35 (20.59%)</td>
</tr>
<tr>
<td>11 year olds</td>
<td>24 (14.12%)</td>
</tr>
<tr>
<td>12 year olds</td>
<td>14 (8.24%)</td>
</tr>
<tr>
<td>13 year olds</td>
<td>18 (10.59%)</td>
</tr>
<tr>
<td>14 year olds</td>
<td>11 (6.47%)</td>
</tr>
<tr>
<td>15 year olds</td>
<td>14 (8.24%)</td>
</tr>
<tr>
<td>16 year olds</td>
<td>17 (10.00%)</td>
</tr>
<tr>
<td>Total</td>
<td>170*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>71 (42.26%)</td>
</tr>
<tr>
<td>Female</td>
<td>97 (57.74%)</td>
</tr>
<tr>
<td>Total</td>
<td>168†</td>
</tr>
</tbody>
</table>

* Age was not reported for 1 child in the youngest child group.
† Gender was not reported for 3 children in the same group.

Table 4.3 outlines the vaccination status of the youngest child in each family.

Hepatitis B vaccination status was reported for 165 children and HPV vaccination status was reported for 148 children. Vaccination rate (receiving at least one dose) of Hepatitis B vaccine was 93.33% (N = 154) compared to the HPV vaccination rate of 23.81% (N =
35). Hepatitis B vaccination status was not reported for six children (3.5%) and HPV vaccination status was not reported for 23 (13.4%) children. A separate bivariate analysis was completed using survey information provided by the participants whose children’s vaccination status was unknown and the results were very similar to the participants whose children’s vaccination status was reported.

**Table 4.3. Hepatitis B and HPV Vaccination Status – Youngest Children**

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Number of Doses</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis B</td>
<td>0</td>
<td>11 (6.71%)</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>14 (8.54%)</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>17 (10.37%)</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>123 (74.39%)</td>
</tr>
<tr>
<td>Total (Yes to at least one dose)</td>
<td></td>
<td>154 (93.33%)</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>165 (100%)</td>
</tr>
<tr>
<td>HPV</td>
<td>0</td>
<td>113 (76.19%)</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>11 (7.48%)</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>11 (7.48%)</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>13 (8.84%)</td>
</tr>
<tr>
<td>Total (Yes to at least one dose) HPV</td>
<td></td>
<td>35 (23.8%)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>148 (100.00%)</td>
</tr>
</tbody>
</table>

* Total number of children  N = 171
± Hepatitis B vaccination status was not reported for 6 children
† HPV vaccination status was not reported for 23 children

Of the 138 parents who had not vaccinated their children against HPV, 46% (N = 80) reported that they would like to vaccinate their children against HPV and 33% (N = 58) did not plan to vaccinate (Table 4.4). When asked about their opinion on the best age
to vaccinate, the majority [29.5%, (N = 51)] responded that 14-16 years was the perfect age. Some participants responded that 8-10 years is the best age group [11%, (N = 19)], while many said 11-13 years is a good age [24.3%, (N = 42)]. Quite a few parents believed that 17 years and above [19%, (N = 33)] is a good age to vaccinate while others [16.2%, (N = 28)] stated that vaccination is not needed at any age. A majority, of parents [86%, (N = 149)] said they generally follow the vaccination recommendations of their pediatricians. About half of the participants [53%, (N = 92)] thought most people they know do not think HPV vaccination is a good idea.

Table 4.4. Parental perceptions about HPV vaccination

<table>
<thead>
<tr>
<th>Variable</th>
<th>N (%) Unless otherwise indicated</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPV Vaccination Intentions</td>
<td></td>
</tr>
<tr>
<td>Already received HPV vaccination</td>
<td>35 (21%)</td>
</tr>
<tr>
<td>Parents who did not vaccinate against HPV</td>
<td>138 (79%)</td>
</tr>
<tr>
<td>Planning to vaccinate against HPV</td>
<td>80 (46%)</td>
</tr>
<tr>
<td>Not planning to vaccinate against HPV</td>
<td>58 (33%)</td>
</tr>
<tr>
<td>Ideal Age to Vaccinate</td>
<td></td>
</tr>
<tr>
<td>08 – 10 years</td>
<td>19 (11%)</td>
</tr>
<tr>
<td>11 – 13 years</td>
<td>42 (24.3%)</td>
</tr>
<tr>
<td>14 – 16 years</td>
<td>51 (29.5%)</td>
</tr>
<tr>
<td>17 years and above</td>
<td>33 (19%)</td>
</tr>
<tr>
<td>Vaccination not needed at any age</td>
<td>28 (16.2%)</td>
</tr>
<tr>
<td>Health Beliefs Constructs (Mean and Standard Deviation)</td>
<td></td>
</tr>
<tr>
<td>Perceived Seriousness M (SD)</td>
<td>4.19 (0.83)</td>
</tr>
<tr>
<td>Perceived Susceptibility M (SD)</td>
<td>2.68 (1.00)</td>
</tr>
<tr>
<td>Perceived Barriers M (SD)</td>
<td>2.76 (0.82)</td>
</tr>
<tr>
<td>Perceived Benefits M (SD)</td>
<td>3.37 (0.85)</td>
</tr>
<tr>
<td>Perception of Others’ Opinions</td>
<td></td>
</tr>
<tr>
<td>Most people think HPV vaccination is not a good idea</td>
<td>92 (53%)</td>
</tr>
<tr>
<td>Perception About Physician’s recommendation</td>
<td></td>
</tr>
<tr>
<td>Generally I do what my physician recommends</td>
<td>149 (86%)</td>
</tr>
<tr>
<td>Total Number of Parents (N) 173</td>
<td></td>
</tr>
</tbody>
</table>
Most of the participants reported no personal experience (including self, family or friends) with abnormal pap-smears, cervical cancer, any other STIs, or genital warts (Table 4.5). The majority of the participants [82%, \((N = 142)\)] responded that gender was not a factor in their decision to vaccinate their children against HPV.

<p>| Table 4.5 Personal experience of the Disease |
|------------------|------------|------------|</p>
<table>
<thead>
<tr>
<th>Variable</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abnormal pap smear</td>
<td>30 (17%)</td>
<td>143 (83%)</td>
</tr>
<tr>
<td>Cervical cancer</td>
<td>14 (8%)</td>
<td>159 (92%)</td>
</tr>
<tr>
<td>STI</td>
<td>19 (11%)</td>
<td>154 (89%)</td>
</tr>
<tr>
<td>Genital warts</td>
<td>11 (6%)</td>
<td>162 (94%)</td>
</tr>
</tbody>
</table>

There were no statistically significant associations between HPV vaccination acceptance and (1) Hepatitis B vaccination acceptance \((P = 0.102)\), (2) gender of the child \((P = 0.968)\), (3) religion \((P = 0.834)\), (4) gender of the participant \((P = 0.776)\), (5) parental education \((P = 0.130)\), and (6) personal experience of the disease \((P = 0.419)\) (Table 4.6). The only two variables in bivariate analysis that demonstrated significant associations with HPV vaccine acceptance included the health belief construct of ‘perceived barriers’ \((P = 0.008)\) and spouse’s opinion under ‘subjective norms’ \((P = 0.028)\). Although many of the participants, including both acceptors and non-acceptors of the vaccine, perceived HPV and associated diseases as either “extremely serious” or “very serious” as evidenced by a high mean score of seriousness perception [Mean (SD) = 4.19 (0.83)], this finding was not associated with parental acceptance of vaccination for their children \((P = 0.64)\).
### Table 4.6. Bivariate Analysis – Chi square

<table>
<thead>
<tr>
<th>Variable</th>
<th>HPV vaccine</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
<td>P-value</td>
</tr>
<tr>
<td></td>
<td>N = 113</td>
<td>N = 35</td>
<td></td>
</tr>
<tr>
<td>Hepatitis Vaccine N (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>105 (92.9%)</td>
<td>35 (100%)</td>
<td>0.102</td>
</tr>
<tr>
<td>No</td>
<td>8 (7.1%)</td>
<td>0 (0%)</td>
<td></td>
</tr>
<tr>
<td>Gender – child N (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>48 (42.9%)</td>
<td>15 (42.9%)</td>
<td>0.968</td>
</tr>
<tr>
<td>Female</td>
<td>65 (57.5%)</td>
<td>20 (57.1%)</td>
<td></td>
</tr>
<tr>
<td>Religion N (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Christian</td>
<td>72 (63.7%)</td>
<td>23 (65.7%)</td>
<td>0.834</td>
</tr>
<tr>
<td>Hindu</td>
<td>23 (20.4%)</td>
<td>8 (22.9%)</td>
<td></td>
</tr>
<tr>
<td>Muslim</td>
<td>16 (14.2%)</td>
<td>4 (11.4%)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>2 (1.8%)</td>
<td>0 (0%)</td>
<td></td>
</tr>
<tr>
<td>Gender – parents N (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>39 (34.5%)</td>
<td>13 (37.2%)</td>
<td>0.776</td>
</tr>
<tr>
<td>Female</td>
<td>74 (65.5%)</td>
<td>22 (62.9%)</td>
<td></td>
</tr>
<tr>
<td>Education N (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;HS</td>
<td>0 (0%)</td>
<td>2 (5.7%)</td>
<td>0.130</td>
</tr>
<tr>
<td>HS degree</td>
<td>6 (5.3%)</td>
<td>1 (2.9%)</td>
<td></td>
</tr>
<tr>
<td>Some college</td>
<td>1 (0.9%)</td>
<td>0 (0%)</td>
<td></td>
</tr>
<tr>
<td>College degree</td>
<td>40 (35.4%)</td>
<td>12 (34.3%)</td>
<td></td>
</tr>
<tr>
<td>Graduate</td>
<td>66 (58.4%)</td>
<td>20 (57.1%)</td>
<td></td>
</tr>
<tr>
<td>Beliefs M (SD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seriousness</td>
<td>4.2±0.6</td>
<td>4.2±0.6</td>
<td>0.643</td>
</tr>
<tr>
<td>Susceptibility</td>
<td>2.7±0.9</td>
<td>2.7±0.9</td>
<td>0.910</td>
</tr>
<tr>
<td>Barriers</td>
<td>2.8±0.6</td>
<td>2.4±0.7</td>
<td>0.008</td>
</tr>
<tr>
<td>Benefits</td>
<td>3.4±0.8</td>
<td>2.4±0.9</td>
<td>0.924</td>
</tr>
<tr>
<td>Likely to have sex early</td>
<td>2.5±0.9</td>
<td>2.4±0.9</td>
<td>0.317</td>
</tr>
<tr>
<td>Likely to engage in risky sex</td>
<td>2.5±1.0</td>
<td>2.4±0.9</td>
<td>0.417</td>
</tr>
<tr>
<td>Likely to have sex at early age</td>
<td>2.6±1.0</td>
<td>2.4±0.9</td>
<td>0.345</td>
</tr>
<tr>
<td>Sex beliefs average</td>
<td>2.5±1.1</td>
<td>2.3±1.0</td>
<td>0.319</td>
</tr>
<tr>
<td>Subjective Norms M (SD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>2.4±0.8</td>
<td>2.5±0.9</td>
<td>0.630</td>
</tr>
<tr>
<td>Spouse</td>
<td>3.4±1.0</td>
<td>3±1.2</td>
<td>0.028</td>
</tr>
<tr>
<td>Child siblings</td>
<td>1.8±1.4</td>
<td>2±1.5</td>
<td>0.574</td>
</tr>
<tr>
<td>Friends</td>
<td>1.8±1.3</td>
<td>2.1±1.4</td>
<td>0.213</td>
</tr>
<tr>
<td>Child's physician</td>
<td>3.3±0.9</td>
<td>3.5±0.7</td>
<td>0.246</td>
</tr>
<tr>
<td>Other family</td>
<td>1.9±1.3</td>
<td>2.1±1.3</td>
<td>0.462</td>
</tr>
<tr>
<td>Personal experience N (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abnormal pap</td>
<td>19 (17%)</td>
<td>8 (22.9%)</td>
<td>0.419</td>
</tr>
<tr>
<td>Cervical cancer</td>
<td>9 (8.0%)</td>
<td>4 (11.4%)</td>
<td>0.527</td>
</tr>
<tr>
<td>STD</td>
<td>13 (11.5%)</td>
<td>4 (11.4%)</td>
<td>0.990</td>
</tr>
<tr>
<td>Genital warts</td>
<td>8 (7.1%)</td>
<td>2 (5.7%)</td>
<td>0.779</td>
</tr>
<tr>
<td>SL-Asia M (SD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.4±0.5</td>
<td>2.5±0.5</td>
<td>0.495</td>
</tr>
</tbody>
</table>
Data analysis by Aims

The results of data analysis by aim are presented below.

**Aim 1:** To determine among Asian Indian parents if there is a difference in HPV vaccine acceptance compared to Hepatitis B vaccine acceptance for their children.

Results from McNemar’s Chi square test for paired categorical data found that although 94.55% of parents accepted Hepatitis B vaccine for their children between the ages of 9-16 years, only 23.8% of parents accepted the HPV vaccine \( (P < 0.001) \). Participants were 27.7 times more likely to accept Hepatitis B vaccine than the HPV vaccine (Table 4.7).

**Table 4.7. HBV vs HPV Acceptance**

<table>
<thead>
<tr>
<th>Hepatitis B Vaccine</th>
<th>HPV vaccine</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Yes</td>
<td>35</td>
<td>105</td>
</tr>
<tr>
<td>No</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>35</td>
<td>113</td>
</tr>
</tbody>
</table>

McNemar Chi square  Probability  
\( P = <0.001 \)

Odds Ratio = 27.7

Proportion that accepted Hepatitis B = 94.59 %

Proportion that accepted HPV = 23.8 %

**Aim 2:** To determine among Asian Indian parents if health beliefs (perceived seriousness, susceptibility, barriers, benefits) affect HPV vaccine acceptance for their children.
The demographics of religion, gender, and educational level were added as co-
variates in the first step, subjective norms, and personal experience of the disease were 
added as co-variates in the second step, and health beliefs were added in the third step of 
the logistic regression model. The statistical program (STATA) default $P$ value threshold 
of 0.2 was used and all variables in the model with $P$ values $\geq 0.2$ were automatically 
dropped from the model during analysis. The first step found that the demographics had 
no effect on HPV vaccination acceptance including religion of the participants ($P = 0.93 
for Hindus and P = 0.81$ for Muslims), Child’s gender ($P = 0.99$), and parental education 
($P = 1.0$).

In step two, total subjective norms, spouse’s opinion, and personal experience of 
the disease were added to the hierarchical logistic regression model. Personal experience 
of the disease was dropped automatically from the model since it was beyond the 
threshold $P$ value of 0.2. The subjective norms, excluding spousal opinion, [OR = 1.69, 
95% CI (1.0, 2.8), $P = 0.04$], and spouse’s opinion alone [OR = 0.57, 95% CI (0.4, 0.9), 
$P = 0.01$] were statistically significant.

In step three of the hierarchical logistic regression model, health belief variables 
were added including perceived seriousness, perceived susceptibility, perceived barriers, 
and perceived benefits representing the four constructs of the HBM. The construct of 
perceived benefits was automatically dropped from the model since its $P$ value was more 
than 0.2. The results found that perceived barriers significantly predicted HPV vaccine 
acceptance [OR = 0.47, CI (0.26, 0.87), $P = 0.02$]. This means that parents who had a 
higher perception of barriers for HPV vaccination were less than half as likely to accept 
the HPV vaccination. Subjective norms excluding spousal opinion [OR = 1.7, 95% CI
remained statistically significant. This means that parents were 1.7 times more likely to accept HPV vaccine if they believed that their friends, family, and pediatricians agreed with their decision, and that participants who valued their spouse’s opinion were slightly more than half as likely to vaccinate their children against HPV. Perceived seriousness 

Sexual disinhibition (promiscuity) barriers were found to be significant predictors of HPV acceptance in previous studies (Gonik, 2006; Visser & McDonnell, 2008, Marlow 2008; Reynolds & O’Connell, 2012). Three variables that constitute sexual disinhibition were added separately to the regression model to determine their effect on HPV acceptance. However, sexual disinhibition was not a significant predictor of HPV vaccination acceptance \( (P = 0.73) \) in the current study. In order to further investigate if perceived barriers without sexual disinhibition predicted HPV acceptance, the data was re-analyzed dropping the sexual disinhibition factor. The results confirmed that perceived barriers significantly predicted HPV vaccination acceptance \( [\text{OR} = 0.47, 95\% \text{ CI} (0.26, 0.87), P = 0.02.] \) without the sexual disinhibition barriers. This means parents who had higher perception of barriers were less than half as likely to vaccinate their children against HPV. The variables included under perceived barriers other than sexual disinhibition encompassed “newly available vaccines can be dangerous,” “worried about the side effects of the vaccine,” “don’t want to give the child too many vaccines,” and “shots are painful and scary for my child.”
Table 4.8. Logistic Regression – Aim 2

<table>
<thead>
<tr>
<th>Aim 2, Step 1</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
<td>OR (95% CI)</td>
<td>Z value</td>
<td>P value</td>
</tr>
<tr>
<td>Religion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hindu</td>
<td>1.0 (0.4, 2.8)</td>
<td>0.09</td>
<td>0.93</td>
</tr>
<tr>
<td>Muslim</td>
<td>0.9 (0.2, 3.0)</td>
<td>-0.25</td>
<td>0.81</td>
</tr>
<tr>
<td>Other</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Christian</td>
<td>1 (Ref)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child’s Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1.0 (0.4, 2.3)</td>
<td>0.01</td>
<td>0.10</td>
</tr>
<tr>
<td>Female</td>
<td>1 (Ref)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;HS degree</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>HS degree</td>
<td>0.7 (0.1, 6.8)</td>
<td>-0.31</td>
<td>0.76</td>
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</tr>
<tr>
<td>Graduate school</td>
<td>1.0 (0.4, 2.3)</td>
<td>0</td>
<td>1.00</td>
</tr>
<tr>
<td>College degree</td>
<td>1 (Ref)</td>
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<table>
<thead>
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<th>Aim 2, Step 2</th>
<th></th>
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<tbody>
<tr>
<td>Religion</td>
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<td></td>
</tr>
<tr>
<td>Hindu</td>
<td>1.2 (0.4, 3.4)</td>
<td>0.35</td>
<td>0.72</td>
</tr>
<tr>
<td>Muslim</td>
<td>1.2 (0.3, 4.4)</td>
<td>0.26</td>
<td>0.79</td>
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</tr>
<tr>
<td>Christian</td>
<td>1 (Ref)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child’s Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1 (0.4, 2.3)</td>
<td>-0.05</td>
<td>0.96</td>
</tr>
<tr>
<td>Female</td>
<td>1 (Ref)</td>
<td></td>
<td></td>
</tr>
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<td>Education</td>
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<tr>
<td>&lt;HS degree</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>HS degree</td>
<td>0.9 (0.1, 8.5)</td>
<td>-0.13</td>
<td>0.90</td>
</tr>
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<td>Some college</td>
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<td>--</td>
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<tr>
<td>Graduate school</td>
<td>1.1 (0.5, 2.6)</td>
<td>0.22</td>
<td>0.83</td>
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<td>1 (Ref)</td>
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<tr>
<td>Subjective Norms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subjective norms excluding spouse</td>
<td>1.69 (1, 2.8)</td>
<td>1.99</td>
<td>0.04</td>
</tr>
<tr>
<td>Subjective norms (spousal opinion)</td>
<td>0.57 (0.39, 0.85)</td>
<td>-2.48</td>
<td>0.01</td>
</tr>
</tbody>
</table>
Table 4.8. Logistic Regression - Aim 2 (Cont’d)

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR (95% CI)</th>
<th>Z value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Religion</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hindu</td>
<td>1.2 (0.4, 3.3)</td>
<td>0.29</td>
<td>0.77</td>
</tr>
<tr>
<td>Muslim</td>
<td>2 (0.5, 8.1)</td>
<td>0.97</td>
<td>0.33</td>
</tr>
<tr>
<td>Other</td>
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</tr>
<tr>
<td>Christian</td>
<td>1 (Ref)</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Child's gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1 (0.4, 2.4)</td>
<td>0.04</td>
<td>0.97</td>
</tr>
<tr>
<td>Female</td>
<td>1 (Ref)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;HS degree</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>HS degree</td>
<td>0.7 (0.1, 7.5)</td>
<td>-0.33</td>
<td>0.74</td>
</tr>
<tr>
<td>Some college</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Graduate school</td>
<td>1 (0.4, 2.4)</td>
<td>-0.05</td>
<td>0.96</td>
</tr>
<tr>
<td>College degree</td>
<td>1 (Ref)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Subjective Norms</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subjective norms excluding spouse</td>
<td>1.69 (1.0, 2.8)</td>
<td>1.94</td>
<td>0.05</td>
</tr>
<tr>
<td>Subjective norms (spousal opinion)</td>
<td>0.59 (0.4, 0.9)</td>
<td>-2.47</td>
<td>0.01</td>
</tr>
<tr>
<td><strong>Perceived Barriers (HBM)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived barriers excluding sexual disinhibition</td>
<td>0.47 (0.26, 0.87)</td>
<td>-2.41</td>
<td>0.02</td>
</tr>
</tbody>
</table>

**Aim 3**: To determine if acculturation (cultural identity) has an effect on HPV vaccine acceptance.

In a hierarchical logistic regression model, child’s gender, parental educational level, and religion were added as co-variates in the first step; subjective norms, spouse’s opinion, and health beliefs were added as co-variates in the second step, and acculturation (SL- ASIA acculturation score) was added in the third step. Results found that acculturation was not a significant predictor ($P = 0.377$) of HPV vaccination acceptance. Acculturation was dropped from the model since it was over the default $P$ value threshold.
of $\geq 0.2$. To confirm this finding, analysis was repeated using only significant variables from step 2 instead of the full model. Hence the following variables were included in the model: child’s gender, education, subjective norms, spouse’s opinion, and perception of barriers without the sexual disinhibition factor. The acculturation factor was again dropped since it did not meet the default $P$ value threshold ($P = 0.276$), confirming that acculturation does not predict HPV vaccination acceptance among Asian Indian parents.

Table 4.9. Logistic Regression – Aim 3

<table>
<thead>
<tr>
<th>Aim 3, Step 1</th>
<th>OR (95% CI)</th>
<th>Z value</th>
<th>$P$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Religion</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hindu</td>
<td>1.1 (0.4, 2.9)</td>
<td>0.12</td>
<td>0.91</td>
</tr>
<tr>
<td>Muslim</td>
<td>0.9 (0.3, 3.3)</td>
<td>-0.12</td>
<td>0.90</td>
</tr>
<tr>
<td>Other</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Christian</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Child’s Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1 (0.4, 2.2)</td>
<td>-0.08</td>
<td>0.94</td>
</tr>
<tr>
<td>Female</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;HS degree</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>HS degree</td>
<td>0.7 (0.1, 7)</td>
<td>-0.28</td>
<td>0.78</td>
</tr>
<tr>
<td>Some college</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Graduate school</td>
<td>1 (0.4, 2.3)</td>
<td>-0.10</td>
<td>0.92</td>
</tr>
<tr>
<td>College degree</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Acculturation (SL-ASIA)</strong></td>
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</tr>
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<td>Acculturation</td>
<td>1.4 (0.6, 3.3)</td>
<td>0.88</td>
<td>0.38</td>
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<td><strong>Aim 3, Step 3</strong></td>
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</tr>
<tr>
<td><strong>Religion</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hindu</td>
<td>1.2 (0.4, 3.4)</td>
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<td>0.71</td>
</tr>
<tr>
<td>Muslim</td>
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<td>0.40</td>
<td>0.69</td>
</tr>
<tr>
<td>Other</td>
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<td>--</td>
</tr>
<tr>
<td>Christian</td>
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</tr>
<tr>
<td><strong>Child’s Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>0.9 (0.4, 2.2)</td>
<td>-0.14</td>
<td>0.89</td>
</tr>
<tr>
<td>Female</td>
<td>--</td>
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</table>
## Table 4.9. Logistic Regression – Aim 3 (Cont’d)

<table>
<thead>
<tr>
<th></th>
<th>OR (95% CI)</th>
<th>Z Value</th>
<th>P - Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;HS degree</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>HS degree</td>
<td>0.9 (0.1, 8.9)</td>
<td>-0.09</td>
<td>0.92</td>
</tr>
<tr>
<td>Some college</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Graduate school</td>
<td>1 (0.4, 2.5)</td>
<td>0.05</td>
<td>0.96</td>
</tr>
<tr>
<td>College degree</td>
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</tr>
<tr>
<td><strong>Subjective Norms</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subjective norms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>excluding spouse</td>
<td>1.7 (1, 2.8)</td>
<td>2.06</td>
<td>0.04</td>
</tr>
<tr>
<td>Subjective norms</td>
<td>0.6 (0.4, 0.9)</td>
<td>-2.54</td>
<td>0.01</td>
</tr>
<tr>
<td>(spousal opinion)</td>
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<tr>
<td><strong>Acculturation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acculturation</td>
<td>1.6 (0.7, 3.8)</td>
<td>1.09</td>
<td>0.28</td>
</tr>
<tr>
<td><strong>Aim 3, Step 3</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Religion</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hindu</td>
<td>1.1 (0.4, 3.1)</td>
<td>0.14</td>
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</tr>
<tr>
<td>Muslim</td>
<td>1.5 (0.4, 6)</td>
<td>0.61</td>
<td>0.54</td>
</tr>
<tr>
<td>Other</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Christian</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Child’s Gender</strong></td>
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<td></td>
</tr>
<tr>
<td>Male</td>
<td>1 (0.4, 2.4)</td>
<td>0.02</td>
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</tr>
<tr>
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<td></td>
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<tr>
<td><strong>Education</strong></td>
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<td></td>
</tr>
<tr>
<td>&lt;HS degree</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>HS degree</td>
<td>0.7 (0.1, 8.5)</td>
<td>-0.25</td>
<td>0.80</td>
</tr>
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<tr>
<td>Graduate school</td>
<td>0.9 (0.4, 2.3)</td>
<td>-0.22</td>
<td>0.82</td>
</tr>
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<td><strong>Subjective Norms</strong></td>
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<tr>
<td>Subjective norms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>excluding spouse</td>
<td>1.7 (1.0, 2.8)</td>
<td>1.94</td>
<td>0.05</td>
</tr>
<tr>
<td>Subjective norms</td>
<td>0.59 (0.4, 0.9)</td>
<td>-2.47</td>
<td>0.01</td>
</tr>
<tr>
<td>(spousal opinion)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Perceived barriers</strong> (HBM)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Barriers</td>
<td>0.47 (0.26, 0.87)</td>
<td>-2.41</td>
<td>0.02</td>
</tr>
<tr>
<td>excluding sexual</td>
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</tr>
<tr>
<td>disinhibition</td>
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<td><strong>Acculturation</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Acculturation</td>
<td>1.7 (0.7, 4.4)</td>
<td>1.08</td>
<td>0.28</td>
</tr>
</tbody>
</table>
To determine the sensitivity of the logistic hierarchical regression models in predicting HPV vaccination acceptance, the data was analyzed using a backward stepwise logistic regression model as well and results were found to be similar. Subjective norms excluding spousal opinion [OR = 1.87, CI (0.99, 3.54, \( P = 0.05 \)], spouse’s opinion alone [OR = 0.51, CI (0.32, 0.84), \( P = 0.01 \)], and perceived barriers [OR = 0.43, CI (0.22, 0.86), \( P = 0.02 \)] still remained statistically significant factors in predicting HPV vaccination acceptance. The other variables including child’s gender, education, and personal experience of the disease were not statistically significant in predicting HPV vaccination acceptance.

**Secondary Aims**

Findings from bivariate (Table 4.6) and logistic regression analyses (Table 4.8) of educational level, religion, gender of the child, and personal experience of the disease suggest that there were no significant associations and none of the factors predicted HPV acceptance. However, findings from the logistic regression analysis in aim 2, subjective norms (other than spouse) had borderline significance with a \( P \) value of 0.05 and spouse’s opinion was significant with a \( P \) values of 0.01 (Table 4.8).

**Additional Analysis**

A Chi square analysis found a significant association between HPV vaccination acceptance and participant’s perception that most people they know think it is a good idea to vaccinate children before they are teenagers [OR = 11.99, \( P = 0.001 \)]. This means that participants who perceived that most people they know (friends and family) approve the HPV vaccination were about 12 times more likely to vaccinate their children against HPV (table 4.10)
Table 4.10. Additional Analysis

<table>
<thead>
<tr>
<th></th>
<th>HPV Vaccination</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
<td>70</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>61.95</td>
<td>28.57</td>
</tr>
<tr>
<td>Yes</td>
<td>43</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>38.5</td>
<td>71.43</td>
</tr>
<tr>
<td>Total</td>
<td>113 (100%)</td>
<td>35 (100%)</td>
</tr>
</tbody>
</table>

Pearson’s Chi Square

OR = 11.99  \( P = 0.001 \)

Reliability of Study Measures

Cronbach’s alpha for all items in the HBM scale was 0.84. Cronbach’s alphas of the perceived seriousness and perceived susceptibility subscales were 0.83 and 0.93 respectively. The perceived benefits and perceived barriers subscales had Cronbach’s alphas of 0.70 and 0.81 respectively. The barriers construct, when further narrowed to sexual disinhibition, had a Cronbach’s alpha of 0.91 and all other barriers had a Cronbach’ alpha of 0.80 excluding sexual disinhibition. The subjective norms measure also displayed acceptable reliability as evidenced by a Cronbach’s alpha of 0.73.

For the SL-ASIA acculturation scale, Cronbach’s alpha for the total scale was 0.88. The PI, after careful evaluation of the SL-ASIA tool, had determined that three questions to assess the ethnic self-identity of the participants needed very minor wording revisions in one of the five response options to better conform to the population of interest. For questions three, four, and five, to the fourth response option in the scale, the ethnic category of “Asian-Indian” was added to the existing ethnic categories.
Cronbach’s alpha for these three questions were separately calculated and was found to be 0.89.

**Open-ended Questions**

There were five open-ended questions which enabled the participants to express their opinion, concerns, and beliefs about HPV vaccination. The first open-ended question was preceded by a question that asked the participants if both Hepatitis B and HPV vaccine were offered at birth or in infancy, which vaccine/vaccines they would have accepted. Of the 173 participants completing this question, as described in table 4.11, 69 (39.9%) participants stated that they would accept both Hepatitis B and HPV vaccine if given at birth or infancy whereas 82 (47.7%) participants preferred only Hepatitis B vaccine. Of the remaining participants, 1.7% (N = 3) favored administering only HPV vaccine and the rest of them did not want either vaccination (N = 19; 11%). The first open-ended question then asked for the reasons behind their preference.

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Yes (N %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both Hepatitis B and HPV vaccine</td>
<td>69 (39.9%)</td>
</tr>
<tr>
<td>Only Hepatitis B Vaccine</td>
<td>82 (47.6%)</td>
</tr>
<tr>
<td>Only HPV vaccine</td>
<td>3 (1.6%)</td>
</tr>
<tr>
<td>None</td>
<td>19 (11%)</td>
</tr>
<tr>
<td>Total</td>
<td>173 (100%)</td>
</tr>
</tbody>
</table>

The responses to the open-ended questions were grouped by their similarities and then most represented response was selected to identify the group (Table 4.12). For the first open-ended question, those who preferred both HPV vaccine and Hepatitis B
EFFECT OF HEALTH BELIEFS AND ACCULTURATION ON HPV

vaccine in infancy most often focused on the following aspects: prevention, concerns about the seriousness of diseases, need to keep their children healthy, consensus about effectiveness of vaccinations, and easiness of administering the vaccinations when they are given together.

Those who would accept only the Hepatitis B vaccine and not the HPV vaccine expressed the following opinions: 1) believed Hepatitis B is more common, more serious, and riskier, 2) believed in protection and prevention benefits of Hepatitis B vaccine 3) lack of trust of the HPV vaccine 4) side effects of HPV vaccine, and 5) recommended age for HPV vaccine is too early in infancy or not needed at any age.

The second open-ended question asked about participants’ thoughts on their child/children’s life time vulnerability to acquire HPV. The majority of the participants who already vaccinated their children stated that there is a higher likelihood of acquiring the virus since their children live in the United States. Many others said the chances of acquiring HPV were low as they have already vaccinated their children. A third group of parents said their children are not vulnerable without giving any specific reasons.

Another interesting factor that the participants pointed out was that contracting HPV may not be an issue as long as they “educate their children about the importance of good moral values, healthy habits, and sex only after marriage.” Some parents suggested that their “religion, faith, and teachings” most likely will help the children to stay away from premarital sexual relationships; hence they are not worried about their children acquiring HPV. A few indicated that they are not sure of their children’s vulnerability evidenced by statements such as “I don’t know, I am not sure, may or may not, and no comment.”
The parents who have not vaccinated their children had responses that were similar in nature. Many parents believed that their children are not vulnerable, or they have very little chance of acquiring the disease. Some parents who did not vaccinate indicated that their children might be vulnerable, but considered it as a common phenomenon as evidenced by statements such as “anyone is vulnerable, [and the] world is changing, so you never know.” Some participants were specific about how they have instructed their children to protect themselves, the importance of instilling good moral values, and how their religious beliefs and faith might protect their children.

The third open-ended question was to the parents who already accepted the vaccination or planning to vaccinate their children, requesting them to reflect upon their reasons to vaccinate their children against HPV. Those who already accepted the vaccination listed prevention, protection, and physician’s recommendation as the most compelling reasons. Those who did not accept the vaccination enumerated protection, prevention, and physician recommendation as the main reasons even though these reasons did not necessarily encourage them to accept the vaccination. A few parents talked about side-effects and recent debut of the vaccine where as some parents strictly felt that their children do not need it.

The fourth open-ended question that asked about reasons for not vaccinating their children against HPV, did not have any responses from parents who accepted the vaccination except “not applicable.” Parents who did not vaccinate had reasons such as lower HPV exposure risk and susceptibility perception, doubts about effectiveness of the vaccine, and lack of enough information about the vaccine.
The fifth and final question was to reflect on what effect their culture, ethnicity, and religious beliefs have on HPV vaccination acceptance. Both groups, (the acceptors and non-acceptors) had similar responses where the majority stated that none of these factors have any effects on HPV acceptance. The findings also suggest that premarital and extra marital sexual relationships and religious teachings play an important role. Even though the participants did not point out sexual promiscuity as a concern, quite a few parents concluded that premarital and extra marital relationships are forbidden in their religion as well as in their culture and this may protect their children from contracting the disease. This was evident among both acceptors and non-acceptors.

Table 4.12. Open-ended Questions

<table>
<thead>
<tr>
<th>Questions</th>
<th>Categories (N)</th>
<th>Sample of Raw Data</th>
</tr>
</thead>
</table>
| 1) If both Hepatitis B vaccine and HPV vaccine were offered at birth/infancy, which vaccine/vaccines would you accept? Please explain your reasoning | Those who would accept both vaccines | “Prevention of both infections are important to me.”
“I believe in vaccinations to prevent infections.”
“To prevent cervical cancer.”
“I believe that vaccination will prevent disease.”
“I believe in preventive medicine.”

Prevention (N = 14) |

Seriousness (N = 5) |

“Both Hepatitis B and cervical cancer are serious diseases.”
“I will do anything to keep my child safe.”
“Cervical cancer is dangerous.”

Sample of Raw Data
Table 4.12. Open-ended Questions (Cont’d)

<table>
<thead>
<tr>
<th>Questions</th>
<th>Categories (N)</th>
<th>Sample of Raw Data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Those who would accept both vaccines</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health of the children (N = 4)</td>
<td></td>
<td>“I would encourage the vaccine to keep my children healthy.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“To keep them healthy.”</td>
</tr>
<tr>
<td>Faith in vaccinations in general (N = 6)</td>
<td></td>
<td>“I believe in all vaccinations.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“I understand that vaccinations are beneficial to the children.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Better to give the vaccinations as it is available.”</td>
</tr>
<tr>
<td>Ease of administration (N = 3)</td>
<td></td>
<td>“It is done and taken care of”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Giving both vaccines at the same time is convenient.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Earlier the vaccinations are given the better I think.”</td>
</tr>
<tr>
<td><strong>Those who did not want to give HPV vaccine</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection and Prevention (N = 18)</td>
<td></td>
<td>“To protect from any disease.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“For prevention.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“It is offered and prevents disease, I will get it for my child.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“For protection.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Needed for girls only”</td>
</tr>
<tr>
<td>Lack of trust about the vaccine (N = 8)</td>
<td></td>
<td>“It is a new vaccine.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“I don’t trust the vaccine.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“HPV is not needed.”</td>
</tr>
<tr>
<td>Side Effects (N = 9)</td>
<td></td>
<td>“Side effects.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Side effects and effectiveness.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Too many issues, vaccines.”</td>
</tr>
</tbody>
</table>
Table 4.12. Open-ended Questions (Cont’d)

<table>
<thead>
<tr>
<th>Questions</th>
<th>Categories (N)</th>
<th>Sample of Raw Data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Those who did not want to give HPV vaccine</td>
<td></td>
</tr>
<tr>
<td>Age of Vaccination (N=7)</td>
<td></td>
<td>“Infancy is too early.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“I think HPV is indicated for teenagers.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“A newborn does not need HPV vaccination.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“HPV vaccine is not needed at any age.”</td>
</tr>
<tr>
<td></td>
<td>Those who accepted the HPV vaccine</td>
<td></td>
</tr>
<tr>
<td>Is vulnerable (N = 8)</td>
<td></td>
<td>It’s a possibility”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Good chance”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“More likely”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“They live in a society which has more people with HPV”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Vulnerable”</td>
</tr>
<tr>
<td>Already protected through vaccination (N = 4)</td>
<td></td>
<td>“My child got the vaccination, I believe this will protect her”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“I think prevention is better, so got the vaccine”</td>
</tr>
<tr>
<td>Not Vulnerable (N = 12)</td>
<td></td>
<td>“Less Likely.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Less chance.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Very less chance.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Unlikely.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Not likely to get infected by the disease.”</td>
</tr>
<tr>
<td>Effect of culture, education, and moral values (N = 6)</td>
<td></td>
<td>“The culture in the USA is different than in Asia, so they may get it.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Unlikely to get the disease as long they are educated well.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Uncommon in our kind of society.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Teach them good habits and sex only after marriage.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“As long as they live with good moral values, they are OK”.</td>
</tr>
</tbody>
</table>
### Table 4.12. Open-ended Questions (Cont’d)

<table>
<thead>
<tr>
<th>Questions</th>
<th>Categories (N)</th>
<th>Sample of Raw Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unsure, do not know (N = 6)</td>
<td></td>
<td>“I don’t know”.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“I am not sure.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“May or may not.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“No comment”.</td>
</tr>
<tr>
<td>Those who did not accept the HPV vaccine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not vulnerable (N = 35)</td>
<td>“Less Vulnerable”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Low chance, very less chance”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Very unlikely, not likely.”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“I am not worried about it”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“My daughter is not going to get</td>
<td></td>
</tr>
<tr>
<td></td>
<td>cervical cancer.”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“She is not vulnerable at this</td>
<td></td>
</tr>
<tr>
<td></td>
<td>age.”</td>
<td></td>
</tr>
<tr>
<td>Is vulnerable (N = 23)</td>
<td>“Anyone is vulnerable.”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Yes, they can get infected in</td>
<td></td>
</tr>
<tr>
<td></td>
<td>spite of precautions.”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Good chance if there is sexual</td>
<td></td>
</tr>
<tr>
<td></td>
<td>interaction with infected person.”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Vulnerable”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Moe vulnerable”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“World is changing, so you never</td>
<td></td>
</tr>
<tr>
<td></td>
<td>know.”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Chances when they become</td>
<td></td>
</tr>
<tr>
<td></td>
<td>adolescents.”</td>
<td></td>
</tr>
<tr>
<td>Effect of age, education, culture, and religion (N = 9)</td>
<td>“Making wise decisions”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“I have given education to my</td>
<td></td>
</tr>
<tr>
<td></td>
<td>children how to protect.”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“If we keep our moral values in</td>
<td></td>
</tr>
<tr>
<td></td>
<td>life, we can prevent this.”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“They are our children, they are</td>
<td></td>
</tr>
<tr>
<td></td>
<td>trustworthy.”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“I am quite confident that my child</td>
<td></td>
</tr>
<tr>
<td></td>
<td>will not engage in premarital sex.”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Proper health education has</td>
<td></td>
</tr>
<tr>
<td></td>
<td>more influence.”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“My child will not have multiple</td>
<td></td>
</tr>
<tr>
<td></td>
<td>sex partners.”</td>
<td></td>
</tr>
<tr>
<td>Questions</td>
<td>Categories (N)</td>
<td>Sample of Raw Data</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>3) If you already have vaccinated or will be vaccinating your child against HPV, what are your reasons?</td>
<td>Those who accepted HPV vaccine</td>
<td>Prevention (N = 15)</td>
</tr>
</tbody>
</table>
| | | “Prevention.”  
| | | “To prevent daughter from getting HPV”  
| | | “To prevent getting HPV.”  
| | | “HPV can be prevented.”  
| | | “Prevention is better than cure.”  
| | Protection (N = 6) | “To protect my child from cervical cancer.”  
| | | “For protection.”  
| | | “To be safe.”  
| | | “I want to make sure my child is safe.”  
| | Physician Recommendation (N = 6) | “Physician recommendation.”  
| | | “I followed the doctor’s advice.”  
| | | “Primary physician recommended.”  
| | | “Per pediatrician recommendation.”  
| | | “Pediatrician recommended.”  
| | | “Recommended.”  
| Those who did not accept HPV vaccine | Protection (N = 31) | “For protection.”  
| | | “To protect.”  
| | | “For protection.”  
| | | “To protect.”  
| | | “To protect my child against HPV.”  
| | | “To protect against cervical cancer.”  
| | | “To protect from genital warts, cancer risks.”  
|
Table 4.12. Open-ended Questions (Cont’d)

<table>
<thead>
<tr>
<th>Questions</th>
<th>Categories (N)</th>
<th>Sample of Raw Data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Prevention (N = 26)</td>
<td>“To prevent HPV.” “For prevention.” “I think prevention is better than cure.” “Want to prevent cervical cancer.”</td>
</tr>
<tr>
<td></td>
<td>Physician recommendation (N = 6)</td>
<td>“Per pediatrician recommendation only.” “I will follow the doctor’s recommendation.” “I will vaccinate in the near future if my doctor is recommending.”</td>
</tr>
<tr>
<td></td>
<td>Side effects and novelty of the vaccine (N = 7)</td>
<td>“Side effects.” “It is a new vaccine.” “If I see the vaccine is without side effects, I may consider it.”</td>
</tr>
<tr>
<td></td>
<td>Unnecessary (N = 4)</td>
<td>“My child doesn’t need it.” “Not planning about it.” “Not necessary.”</td>
</tr>
</tbody>
</table>

4) If you haven’t vaccinated already or will not be vaccinating your child against HPV, what are your reasons?

|                                                                           | Those who accepted HPV vaccine                                               | “Not applicable.”                                                                                                                                   |
|                                                                           | Not applicable since they vaccinated already                                | “Not applicable.”                                                                                                                                   |
|                                                                           | Those who did not accept HP vaccine                                          | “Cancer risks are low among boys.” “My child will not have sex until 23, so I am not worried about it.” “I think they will never get exposed. It is an American disease.” “Not necessary since they will have only one sex partner.” “I believe in my kids.” “My children or not likely to get infected.” “They are safe” |
### Table 4.12. Open-ended Questions (Cont’d)

<table>
<thead>
<tr>
<th>Questions</th>
<th>Categories (N)</th>
<th>Sample of Raw Data</th>
</tr>
</thead>
</table>
| Doubts about effectiveness of the vaccine (N = 8)                         |                                                                               | “I don’t see a point in these vaccinations.”  
“Not sure if this vaccine is effective.”  
“Todn’t want my child to have another vaccine.”  
“It is a new vaccine.”  
“There is no proven benefit.”  
“Need to learn more about this.”  
“Have not researched about it enough.”  
“Worried about side effects of the vaccine.”  
“I have to confirm with the pediatrician.”  
“Need more time to decide.”  
“They are not sexually active.”  
“Not the right time.” |
| Lack of Information (N = 9)                                               |                                                                               | “No effect.”  
“No such belief was applied in my decision.”  
“I do not take culture etc. to take decisions about HPV vaccine.”  
“My religion is not against any vaccination.”  
“In my culture, no restrictions against vaccine.”  
“I do not worry about religion when it comes to safety of my family.”  

5) What effects do your culture, ethnicity, and religious beliefs have on acceptance or non-acceptance of HPV vaccine?

<table>
<thead>
<tr>
<th>Questions</th>
<th>Those who accepted the HPV vaccine</th>
<th></th>
</tr>
</thead>
</table>
| No effect (N = 21)                                                        |                                                                               | “No effect.”  
“No such belief was applied in my decision.”  
“I do not take culture etc. to take decisions about HPV vaccine.”  
“My religion is not against any vaccination.”  
“In my culture, no restrictions against vaccine.”  
“I do not worry about religion when it comes to safety of my family.”  


### Table 4.12. Open-ended Questions (Cont’d)

<table>
<thead>
<tr>
<th>Questions</th>
<th>Categories</th>
<th>Sample of Raw Data</th>
</tr>
</thead>
</table>
| Approach to premarital sand extra marital sex (N = 8) | “No cultural beliefs, it’s our choice.”  
“Culture is not against vaccine, but premarital sex is not allowed.”  
“People from my cultural background may have apprehension, also premarital sex is forbidden.”  
“No sex prior to marriage.”  
Though I grew up in a different culture, my children are Americanized.”  
“Teaching the kids not to have extramarital relationships.” | |
| Those who did not accept HPV vaccine | No effect (N = 66) | “None.”  
“No effect on getting vaccination.”  
“No restrictions on getting vaccination.”  
“I don’t care about culture in health matters.”  
“No effects whatsoever.”  
“Culture and religion will not affect treatment decision.”  
“It doesn’t matter.” | |
| Religious teachings and beliefs about premarital sex (N= 12) | “Per my religious beliefs, there is no need for this vaccine, but my child is growing in a very different culture.”  
“In our culture, this age group does not have active sexual life, only after marriage.”  
“No cultural impact on vaccine, however premarital sex has lots of impact.”  
“In my religious thought, this is not necessary.” | |
Table 4.12. Open-ended Questions (Cont’d)

<table>
<thead>
<tr>
<th>Question</th>
<th>Category (N)</th>
<th>Sample of Raw Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>“My religion believes in abstinence.”</td>
<td></td>
<td>“Due to religious teachings and parental culture, I believe that kids will not indulge in unprotected sex.”</td>
</tr>
<tr>
<td>“Religion does not talk about vaccination but encourages monogamy.”</td>
<td></td>
<td>“My culture educate my son to abstain from sex till he gets married.”</td>
</tr>
<tr>
<td>“My culture and religion encourages monogamy and abstinence.”</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Chapter 5: Discussion, Conclusions, and Recommendations

This chapter presents the major findings of the study, comparison of results to existing literature, recommendations for future research, implications for practice, and study limitations.

Overview of the Study

The purpose of this study was to compare the rates of HPV vaccination acceptance vs Hepatitis B vaccination for their children among Asian Indian parents and also to determine if health beliefs and acculturation predict HPV vaccination acceptance. The three primary research aims were to determine if: (1) there is a difference in HPV vaccination acceptance compared to Hepatitis B vaccination, (2) health beliefs (perceived seriousness, susceptibility, barriers, and benefits) predict HPV vaccination acceptance, and (3) acculturation predicts HPV vaccine acceptance. The secondary aims were to determine if parental educational level, religious affiliation, gender of the child, subjective norms, and personal experience of the disease affect HPV vaccination acceptance. Participants were recruited from different settings through Asian Indian religious and cultural organizations using email and by word-of-mouth. Findings from this study suggest that perceived barriers, subjective norms, and spousal opinion were significant predictors of HPV vaccination acceptance among the population of interest. This study was the first to evaluate Asian Indian parents’ acceptance of HPV vaccination for their children in the United States.
Discussion

The study sample consisted of Asian Indian parents who had children between ages 9-16 years, living in the United States. The majority, 91%, (N = 158) of the study participants, had a baccalaureate degree or higher compared to 71% of the general Asian Indian population living in the United States. The level of education in the study sample was closer to that of more recent immigrants, arriving since 2000 in which 81% have a baccalaureate degree or higher (Pew Research Center [PRC], 2012). Per the PRC report (2012), the average annual household income of Asian Indians living in the United States is $88,000, not adjusted for age, whereas 57% of the study participants in the current study reported their annual household incomes as more than $100,000 and 84% of them reported more than $ 75,000.

Almost all of the participants of the survey were married (98%, N = 171), compared to the general Asian Indian population, in which 71% of the people were married (not adjusted for age) (PRC, 2012). The same PRC report had concluded that 92% of Asian Indian children live with two married parents which, is comparable to the study sample. Only parents who had children between the ages of 9-16 years were included in the study and children in this age group normally live with their parents. Although the mean age for Asian Indians living in the U.S. is reported as 37 years, the mean age of participants in the current study was 44 years. A reasonable explanation for this may be that the participants were limited to the specific age group of people who have children between the ages of 9 -16 years, and therefore tend to be older. In summary, the study participants had higher education, income, and rates of marriage compared to the general population of Asian Indians living in the U.S.
The first aim of this study was to determine if there was a difference in HPV vaccination acceptance compared to Hepatitis B vaccination acceptance among Asian Indian parents. When the rates of vaccination were compared, the findings suggest that Hepatitis B vaccination acceptance is much higher than HPV vaccination acceptance in the study population (94.6% vs 23.8%, OR = 27.7, \( P = <0.001 \)). Among the study sample, there were only eight participants who declined both Hepatitis B and HPV vaccination. It is interesting to note that when parents declined Hepatitis B vaccine, they also declined the HPV vaccine. Among all participants who accepted Hepatitis B vaccine, only 27% accepted the HPV vaccine.

Although there is no previous research on HPV acceptance among Asian Indian parents, comparison to the general population in the United States where more than 92% of children have received the three dose course of Hepatitis B vaccination and 60% of children received at least one dose of HPV vaccine, the current study found that among Asian Indian parents Hepatitis B vaccination acceptance rates are comparable, but HPV vaccination acceptance rates are much lower (23.8% vs 60%) (Teen vaccination coverage, CDC, 2014). The higher acceptance of Hepatitis B vaccination may be related to several factors including: (1) Hepatitis B vaccination is offered in infancy, (2) mandatory vaccination for school admissions, (3) Asian Indian parents’ perception that Hepatitis B is more serious than HPV, and (4) Hepatitis B vaccine has been in use for much longer than HPV vaccine [1982 vs 2006, (CDC, n.d)]. Therefore, it is possible that if the HPV vaccination is offered in infancy as a mandated vaccination or as a requirement for school admissions, parents may more readily accept the vaccination. These inferences need to be researched further to reach more definitive conclusions.
The second aim was to determine if health beliefs (perceived seriousness, perceived susceptibility, perceived barriers, and perceived benefits) predict HPV vaccine acceptance among Asian Indian parents. Among the four health belief constructs, only perceived barriers (without the sexual disinhibition barriers) predicted HPV vaccination acceptance \[ \text{OR} = 0.47, 95\% \text{ CI} (0.26, 0.87), P = 0.02 \]. Parents who expressed a higher level of perceived barriers were less than half as likely to accept HPV vaccination. The findings highlight major parental concerns among Asian Indian parents that might be causing them to decline HPV vaccination for their children, including potential physical discomfort for their children, possibilities for side effects, and uncertainty of long term effects. These concerns indicate lack of accurate understanding of risks and benefits of the HPV vaccine. In addition, parents may not be considering or understanding the negative physical, psychological, and social sequelae that may occur if their children acquire HPV infection.

This result is similar to previous HPV vaccination acceptance studies conducted among the general population in the U.S. and other countries, where safety and discomfort concerns have been found to be significant barriers to HPV vaccination (Marlow et al., 2009; Reynolds & O’Connell, 2012). Dempsey et al (2006) concluded that decreased HPV vaccine acceptability is directly related to concerns about children experiencing substantial discomfort or harm from vaccinations. A descriptive cross-sectional study conducted by Kahn et al (2008) also found that safety concerns, including fear of intramuscular injections in general, predicted negative vaccination acceptability. Another cross-sectional descriptive survey conducted in Sweden highlighted similar concerns where 90% of parents expressed significant fears of side effects and adverse
effects, which in turn adversely affected HPV acceptance for their children (Dahlstrom et al., 2010).

Findings from previous studies conducted in the United States and England suggest that fear of sexual promiscuity or sexual disinhibition was a major concern among parents considering HPV vaccination for their children (Gonik, 2006; Marlow et al., 2007; Visser & McDonnell, 2008; Reynolds & O’Connell, 2012). In contrast, findings from another study conducted in the U.S did not support maternal concerns about the vaccination encouraging early or unsafe sexual activity as a factor in low HPV vaccination rates (Askelson et al., 2010). Similar to the Askelson et al (2010) findings, the current study found that sexual disinhibition was not a significant predictor of HPV vaccination acceptance among Asian Indian parents ($P = 0.32$). This finding might be directly related some of the factors that came to light through this study such as (1) parental beliefs that their children are not vulnerable to HPV, (2) religious teachings will keep their children away from premarital sexual relationships, (3) instilling ‘good moral values’ will help their children to make wise decisions, and (4) their cultural background would somehow protect their children from behaviors that may expose them to HPV infection. To further validate these observations, additional research, most likely qualitative in nature is warranted.

In the current study, the above mentioned factors emerged mostly through their responses to the open-ended questions. Asian Indian parents expressed their hopes that because of their “cultural beliefs,” “moral values,” and “religious teachings,” they do not expect their children to engage in premarital, risky, or early sexual activities. These answers suggest a collective belief that sexual promiscuity is not within the realm of
EFFECT OF HEALTH BELIEFS AND ACCULTURATION ON HPV

possibility in Asian Indian families. This may further explain why sexual disinhibition (within the HBM construct) was not identified as a major barrier by this study population. 

In contrast, the main barriers for HPV vaccination acceptance among Asian Indian parents center on safety concerns, side effects of new vaccinations, and receiving too many vaccines within a short period of time. These findings are consistent with the American Academy of Pediatrics (AAP) statement that parental refusal may stem from factors such as false sense of security, as well as the lack of factual information about safety and efficacy of vaccinations (AAP, n.d).

None of the other health belief constructs (perceived seriousness, perceived susceptibility, and perceived benefits) significantly predicted HPV vaccination acceptance in the current study. Although many of the participants, including both acceptors and non-acceptors of the vaccine, perceived HPV and associated diseases as “extremely serious” or “very serious,” perceived seriousness did not significantly predict parental HPV vaccination acceptance. The level of perceived seriousness was almost identical between groups and raises the question of why some participants deter from vaccinating even after perceiving the seriousness of the condition, while others vaccinate. A similar phenomenon was reported in a previous study where perceived seriousness of the disease appeared to have no influence on vaccination initiation (Reiter, Brewer, Gottlieb, McRee, & Smith, 2009). The investigators of this study admit potential measurement bias because a large majority of parents (96% of participants) responded that they believed cervical cancer was either ‘extremely serious’ or ‘very serious’ and the researchers reported a lack of variation in response (Reiter, Brewer, Gottlieb, McRee, & Smith, 2009). Similarly, there may also be potential measurement bias in response in the
current study due to lack of variation since a majority of the Asian Indian parents responded that they believe HPV is a serious disease. It seems like the majority of the parents knew that HPV infection and cervical cancer are serious, but for many of them factors such as barriers and spousal opinion were more important than perceived seriousness in regard to decision-making.

Analysis of the open-ended questions found that some parents believed that vaccinated children are not susceptible, but others listed reasons such as “anyone is vulnerable,” and “the world is changing.” Some parents believed that instilling “good moral values and religious beliefs” would make their children less susceptible to the disease. Many parents also expressed the belief that their children will not be sexually active until they are married and hence will not be susceptible to HPV. This attitude is consistent with observations made in the study by Marlow (2011), where minority parents of Southeast Asian origin tend to believe that their children are not as susceptible to HPV due to religious beliefs and cultural attitudes, hence declining or delaying HPV vaccination for their children. Another study that explored parental perception of susceptibility reported that perceived susceptibility improves vaccination acceptance, but a study limitation may be that parents who had already vaccinated their children may have lower perceived susceptibility (Reiter et al., 2009). Similarly, in the current study, through the open-ended questions, parents who already accepted the vaccination had expressed the belief that their children are not vulnerable to HPV infection because they are vaccinated.

In a similar study conducted in Midwestern U.S, the researchers suggested that mothers accepted the vaccination for their daughters due to positive attitudes such as
viewing the vaccination as necessary and beneficial ($\beta = 0.61$, $P < 0.001$) in spite of low perceived susceptibility (Askelson et al., 2010). The authors postulated that the risk of acquiring infection is relatively poorly understood by general public and greatly dependent on culture and norms of the society. Many of the participants in the current study had also expressed similar concerns that they do not know enough about the risks of exposure infection, the vaccination, its benefits or side effects.

Poor understanding of the disease process and risk of acquiring infection might be another reason for low susceptibility perception among Asian Indian parents. The majority (90%) of the participants did not have any personal experience of the disease nor did they know of anyone close to them experiencing HPV infection or cervical cancer. Since the parents had very limited personal experience of HPV, they may have also perceived that their children would be less susceptible to HPV infection.

The third aim of the study was to determine if acculturation affects HPV vaccination acceptance among Asian Indian parents for their children. Acculturation did not predict HPV vaccination acceptance among Asian Indian parents ($P = 0.38$). This may be related to the fact that the majority of the participants (92%, N = 159) were first generation American immigrants so there was little variation in acculturation responses. There were no prior studies to compare the effect of acculturation despite a number of available studies that examined race, ethnicity, and religion (Brabin et al., 2006; Gerend et al., 2008; Marlow et al., 2009; Askelson et al., 2010).

The secondary aims of the study were to determine if parental educational level, religion, gender of the child, subjective norms, and personal experience of the disease predicted HPV vaccination acceptance. Total subjective norms (excluding spousal
opinion) had borderline significance whereas spousal opinion (alone) significantly predicted HPV vaccine acceptance. The predictive effect of subjective norms became more evident when the subjective norms were split into: (1) subjective norms including family (other than spouse), friends, and pediatrician [OR = 1.69, 95% CI (1.0, 2.8), \( P = 0.05 \)] and (2) spousal opinion alone [OR = 0.59, 95% CI (0.4, 0.9), \( P = 0.01 \)]. Participants who valued the opinion of friends and family (other than their spouse) were 1.7 times more likely to vaccinate their children against HPV. Those who valued their spouse’s opinion were only slightly more than half as likely as others to accept the HPV vaccine for their children.

The parents who valued others’ opinions may have felt more comfort in giving the vaccination because of their perceptions that other people (friends and family) also are either vaccinating or supporting vaccination. Moreover, they might be feeling some sort of a kinship in taking the action (vaccination) because it conforms to the opinion of the majority and gives them a moral boost in their own decision to vaccinate. One possible explanation for spousal opinion predicting reduced HPV vaccination may be when parents discuss HPV vaccination without factual input from pediatric providers, they may be less informed and thus their decisions may not be evidence-based. Parents may also consider the decision to vaccinate as a personal/joint decision of the couple rather than something to discuss with outsiders. In addition, parents from the same household most likely may have similar opinion about the vaccination, and when they do not consult with anyone else, there are no external factors that would encourage or educate them to objectively consider their decision.
Prior research offers some explanation for the effect of subjective norms on HPV vaccination acceptance. In a cross-sectional descriptive study, findings suggest that subjective norms (normative beliefs) are significantly associated with HPV vaccination acceptance (Kahn et al., 2008). Similar results were observed in studies conducted by Reynolds and O’Connell (2012) and Dempsey et al. (2006). None of these studies specifically observed the effect of spousal opinion on HPV vaccination acceptance, but Marlow et al. (2009) found that in England, ethnic minority parents from Southeast Asia, especially Indians (61%), prefer to have a joint decision involving both parents on whether to administer the HPV vaccination. Further study is suggested to determine how joint parental decision-making can have an adverse effect on HPV vaccine acceptance.

Another interesting finding in the current study was the results of a Chi square analysis to determine if there was an association between HPV vaccination acceptance and perception that most people whom they know think it is a good idea to vaccinate children before they are teenagers. The results positively identified a clear association between these two factors (OR = 11.99, P = 0.001). Participants who perceived that other significant people (friends and family) approve HPV vaccination were about 12 times more likely to vaccinate their children against HPV. This conclusion is consistent with the findings of subjective norms (other than the spouse). The parents might be influenced by the perception that if others approve the HPV vaccination, it might be beneficial, socially acceptable, and hence they should also obtain it for their children to protect against HPV.

Educational status of the parents was not a significant factor presumably because 91% (N = 158) of parents had a baccalaureate degree or higher making the sample almost
homogenous for education. Similar to acculturation, education of parents did not have any significant effect on vaccination acceptance most likely due to lack of variation.

Hence it becomes evident that all components of the Health Belief Model (the theoretical framework used) was not applicable to this study population. A modified HBM diagram is given below that represents the predictive factors identified for HPV vaccination acceptance through the current study.

![Figure 5.1 Modified Health Belief Model Predicting HPV Vaccine Acceptance](image-url)

**Figure 5.1 Modified Health Belief Model Predicting HPV Vaccine Acceptance**
Discussion of Responses to Open-ended Questions

Parental reasons for vaccinating against both Hepatitis B and HPV included prevention, concerns about the seriousness of the disease, need to keep their children healthy, and ease of administration. Many parents (47.7%, N = 82) preferred only the Hepatitis B vaccine even if both vaccines were offered at birth. Some of the reasons offered by parents included a perception of increased seriousness of Hepatitis B, less concerns about contracting HPV, non-mandatory status of the HPV vaccine, and the newness of the HPV vaccine.

Some parents expressed other reasons for not vaccinating against HPV such as sexual transmission of HPV (which they believe is less likely to occur to their children) and preference for their children receiving the vaccine at a later age. Parents may feel more positive about Hepatitis B vaccination because it has been available for many decades now, is offered during infancy, is a mandatory requirement for school admissions, and perceive that the HBV vaccine is more acceptable to their families and friends. Some of these opinions resonate with findings from previous research, which highlight reasons for refusing HPV vaccine such as safety concerns (AAP, n.d).

When asked about their children’s vulnerability, parents who vaccinated against HPV stated that their children may not be vulnerable to HPV due to their vaccination status. Many parents expressed hopes that their children would not be vulnerable as long as the children were educated about good moral values, healthy habits, and starting sexual relationships only after marriage. Some parents presumed that their religious teachings, faith, culture, and moral values would prevent HPV exposure. These opinions were the same across both acceptance and non-acceptance groups. Similarly, the
participants, both acceptors and non-acceptors of the vaccination were very clear in presenting their opinion that the decision to vaccinate their children is not influenced by their culture, religion, or moral beliefs. At the same time, they expressed the belief that though religion or culture do not prohibit the vaccine itself; they do prohibit premarital sex, risky sexual behaviors and sexual relationships outside of marriage. Thus it can be hypothesized that Asian Indian parental hesitancy to vaccinate may be related to the belief that teachings within religion and culture, and moral values will prevent their children from acquiring the disease. Further, Asian Indian parents may question the rationale for vaccination against a disease that is strictly transmitted through sexual contact for their children.

In general, parents who vaccinated their children against HPV may have believed that children are not vulnerable because they are protected by vaccination, and therefore the odds of HPV exposure are minimal. This perception could be related to lack of understanding about (1) HPV infection, (2) its extensive presence in the society, (3) the highly contagious nature of the disease, (4) potential for complications, and (5) lack of understanding about the benefits of vaccination.

The responses to the open ended questions highlight parental beliefs that their faith, religion, teachings, family values, and cultural background would protect their children from acquiring HPV. Moreover, they may have a false sense of security originating from their beliefs that these values and teachings would protect their children from exposure to HPV. Asian Indian parents may not be differentiating their personal experiences with the norms of the culture they grew up with from the experiences of their children outside this culture. Hence, parents may not fully appreciate their children’s
increased likelihood of acquiring HPV within the context of a different culture. This is consistent with the findings of lower perceived susceptibility and associated hesitancy to vaccinate in this sample.

Other factors such as the newness of HPV vaccine, coupled with uncertainty of its effectiveness, and concerns about side effects might also be deterrents for vaccination acceptance. For many parents, the physician’s recommendation was highlighted as a major factor that influenced their decisions about HPV vaccination, as several parents reported that they would rely on their pediatrician’s recommendations about the vaccination. This observation is consistent with the participants’ responses to the subjective norms questions. Even when the parents do not fully appreciate the risks for acquiring HPV infection, their faith in pediatric providers’ opinions demonstrates their willingness to listen to healthcare professionals. Hence the role of health professionals in improving the acceptance of HPV vaccination should not be underestimated.

**Implications for Practice**

The findings of this study suggest that educational interventions targeting perceived barriers, spousal opinion, pediatric providers, and other significant people who have an influential effect on parents may positively affect HPV vaccination rates. Parents had expressed concerns about the side effects of the vaccine, potential discomfort and pain associated with vaccine, and lack of belief in the efficacy of the vaccine. Moreover, parents displayed lack of understanding about the prevalence of HPV in the society, its highly infectious nature and high likelihood of their children acquiring the disease at some point in their lives. Parents also had expressed confidence in information provided by their pediatric providers and healthcare personnel in decision-making. Many parents
also expressed how family and friends affect their HPV vaccination decisions. Hence it becomes clear that these specific areas need special attention when any type interventions are formulated.

Educational efforts that inform parents about the vaccination itself, its efficacy, and the prevalence of HPV in society may be highly warranted. Parents need to be informed about the highly infectious nature of the disease and possible physical, social and financial effects of HPV infection. Asian Indian parents need encouragement to re-examine their beliefs about whether teachings within culture and religion can really prevent HPV infection among children. It is critical to dispel parental myths about premarital sexual relationships, the role of faith and religion, and parent-to-child teachings within the context of Western culture.

Parents listed their reasons for readily accepting Hepatitis B vaccine as follows: (1) Hepatitis B is a riskier and more serious, (2) it is offered in infancy along with other vaccines, and (3) it is required for school admissions. Policy changes may be considered to address these identified issues such as offering the vaccine early in infancy as a mandatory vaccination or making it required for school enrollment to help Asian Indian parents perceive HPV vaccination as necessary.

In addition, education of pediatric providers may be warranted so they are aware of their potential influence on Asian Indian parents regarding parental decision-making on the HPV vaccine. Once the pediatric provider understands the effect of their influence, they could offer parental education sessions within the office setting (rather than simple casual mention of the HPV vaccine) targeting Asian Indian parents to improve HPV vaccination rates. Pediatric office-based question and answer sessions also might be
helpful in appreciating parental concerns about the vaccine and to provide an opportunity to address them to assist parents to make an informed decision. Community-based educational efforts through cultural and religious organizations may also assist this study population since many of them expressed lack of proper understanding about the disease and the vaccination, and receiving this information from trusted organizations might improve HPV vaccination rates. Another important aspect to remember is that since spousal opinion in decision-making is critical in this population; any informational/educational effort should be targeted to both parents.

**Suggestions for Future Research**

The current study validated some of the information available through research, such as the role of perceived barriers and subjective norms on HPV vaccination acceptance. Although acculturation was not a predictor of HPV vaccination acceptance, the number of years lived in the U.S. for each participant may give more insight into HPV vaccination acceptance if a comparison is made between recent immigrants and established immigrants. Since the open-ended questions highlighted the study population’s low perception of HPV susceptibility, a qualitative study to determine the factors that contribute to low perceived susceptibility might be helpful to fully articulate the reasons behind this belief. A qualitative study to obtain additional information about spousal role in healthcare decision-making, especially on HPV vaccinations, in this community is also highly warranted.

Further study is needed to validate some of the observations made through open-ended questions from the current study comparing HPV to Hepatitis B vaccine acceptance such as the reasons for increased acceptance, timing of vaccinations, and
perception of seriousness of infection exploring further the factors that make hepatitis B vaccine more acceptable to parents. Similarly, the role of religion, parental beliefs of the significance of cultural and moral values need to be further investigated. Qualitative study focusing on these aspects may provide a more in-depth perspective on the findings of the current study.

A comparative interventional study to examine the effects of HPV education provided in the pediatric office vs. community-based education may help to determine the best location for delivering education about HPV infection and the vaccination. Studies which include Asian Indian parents and parents from other ethnicities in the United States could facilitate direct comparison between ethnic groups. Finally, unlike many other studies, because sexual disinhibition did not emerge as a significant predictor of HPV acceptance in this study, further research is needed to confirm the findings of this study.

**Study Limitations**

Limitations that may affect validity of the findings include the inability to assure equal participation of individuals from all strata of socioeconomic status and religious backgrounds. The use of convenience sampling may have provided a sample that was not representative of the Asian Indian population in the U.S. However, the study successfully recruited participants not only from a single metropolitan area, but from various geographical regions of the U.S. The study included only English speaking parents with an assumption that most Asian Indian parents speak English, but this could have led to inadvertent omission of parents who are not comfortable with answering survey questions administered in English.
Hepatitis B vaccination status was not reported for six children (3.5%) and HPV vaccination status was not reported for 23 (13.4%) children, which could potentially introduce bias into the study. A separate univariate analysis, however, was completed using survey information provided by the participants whose children’s vaccination status was unknown and the results were very similar to the participants whose children’s vaccination status was reported.

The cross-sectional design of the study, despite its ease in administration, does not allow for observation of change over a period of time or establish cause and effect. The time disparity in which both vaccinations were offered (Hepatitis B in infancy vs. HPV in pre-adolescence/adolescence) may have limited the comparison of vaccine acceptance. Finally, since non-Asian Indian parents were not included in the current study, a direct comparison of vaccination acceptance rates between Asian Indian and non-Asian Indian parents was not possible.

Conclusions

To our knowledge, this is the first study conducted to determine factors affecting HPV vaccination acceptance among Asian Indians in the U.S. Using the modified HBM model as the theoretical framework, this study found that HPV vaccination acceptance (receiving at least one dose) was lower (23.8%) among Asian Indians parents compared to parents in the general US population (60%) (Teen vaccination report, CDC, 2014). The study findings suggested three factors that predicted HPV vaccination acceptance among Asian Indian parents including perceived barriers (safety and discomfort concerns), subjective norms, and spousal opinion.
Educational programs specifically designed to address perceived barriers, as well as providing accurate information on prevalence of HPV in Western culture, risk of exposure, highly infectious nature of the disease, and susceptibility may be critical to improving HPV vaccination acceptance among Asian Indian parents living in the United States. Dispelling myths related to moral values, religious teachings and cultural norms should be vital components in education since they are key components in non-acceptance of the vaccination against HPV. Providing more accurate information about the vaccination itself and its side effects, rationale for administration at the recommended age, and addressing barriers such as physical discomfort and pain may serve to increase parental trust in the benefits of HPV vaccination.

Individually tailored and culturally competent education addressing close knit communities, friends and families may be more successful in improving HPV vaccination rates compared to standard HPV vaccination education aimed at the general population. In addition, because the decision to vaccinate among Asian Indian parents is a joint effort between both spouses, targeted educational interventions including both parents may also be critical to improving HPV vaccine acceptance rates. This is specifically important in this population as parents who valued their spousal opinion displayed a clear negative effect on HPV vaccination acceptance. As the majority of the parents expressed their willingness to listen to their pediatric providers, educational interventions occurring in the provider offices that target perceived barriers and spousal opinion may also be critical to improving HPV vaccination acceptance rates among Asian Indian parents living in the United States. Finally, educational programs need to be developed targeting the provider communities and healthcare personnel informing them about the specific factors that
drive vaccination acceptance among Asian Indian parents. The current study sheds light on some of the factors that are unique to Asian Indian parents in HPV vaccination acceptance that were never examined or understood before. Hence the findings of this study can be used as a stepping stone to inform further studies and programs to improve Asian Indian parental acceptance of HPV vaccination for their children.
References


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Appendix A - PRISMA Flow Diagram – Search Methodology

Records identified through database searching (n = 722)

Additional records identified through other sources (n = 36)

Records after duplicates removed (n = 134)

Records screened (n = 134)

Records excluded (n = 88)

Full-text articles assessed for eligibility (n = 56)

Full-text articles excluded, with reasons

Studies included in qualitative synthesis (n = 8)

Studies included in quantitative synthesis (meta-analysis) (n = 38)
Appendix B - Health Beliefs, Demographics, and Acculturation Questionnaire

HPV Vaccination and Health Beliefs Survey

Q1 Drexel University Recruiting Volunteers for a Research Study
Research Title: Effect of Health Beliefs and Acculturation on HPV Vaccination Acceptance among Asian Indian Parents
Research Objectives: The purpose of this study is to find out if Asian Indian parents have different opinions about giving the HPV vaccine compared to the Hepatitis B vaccine to their daughters and sons. We will be giving you an anonymous survey, which means that we will not be able to identify who you are and that your answers will be private. The survey will take about 20 minutes to finish. HPV is a virus that causes most of the cervical cancers, throat cancers, anal cancers, and genital warts. This virus usually does not cause any symptoms (except in genital warts). A person can get HPV through close sexual contact. The vaccination is a three series vaccination that can be given to children, both boys and girls, starting from age 9. There are no right or wrong answers to this survey. No personal identifying information is needed to complete this survey and the survey question answers are confidential and protected. It will be used only for research purposes, so please be as honest as you can. Your views about this vaccination are very valuable to our research and we would be very grateful if you could complete this questionnaire. Your participation is completely voluntary.

Eligibility to Participate in the Survey:
- Asian Indian parents with at least one child between nine and sixteen years old who consent to the study
- Self-identification as Asian Indian.
- Asian Indian parents currently living in the United States

Remuneration: There is no payment for this study. If you are willing to leave your email address after you finish the survey, you will be entered into a lucky draw for one of the three gift cards (one gift card worth $50.00 and two gift cards worth $25.00 each). I am happy to answer any questions you may have regarding this research study and hope to have your support for this important research. If you have any questions, please call me at 267-342-1117 (cell) or email dgm27@drexel.edu or daisygeorge@hotmail.com. I will answer your messages within 24 hours. Sincerely, Daisy Mullassery DrNP©, MSN, WHNP-BC

This research is conducted by a researcher who is a student at Drexel University, Philadelphia.

Q2 Do you have children between the age group of 9 to 16 years?
- Yes (1)
- No (2)

If No Is Selected, Then Skip to End of Survey

Q3 Drexel University Electronic Consent to Take Part in a Research Study

1. Title of research study: Effect of Health Beliefs and Acculturation on HPV Vaccine Acceptance among Asian Indian Parents
2. Researcher: PI: Dr. Barbara Posmontier PhD Co-Investigator: Daisy Mullassery DrNP©, MSN, WHNP-BC
3. Why you are being invited to take part in a research study and why sign this document. We invite you to take part in a research study because you are an Asian Indian parent. To be in this study, you must read this document and give your consent before entering the study link. This is an anonymous survey, which means we will not know who you are.
4. What you should know about a research study? The information about this research is given in the first page of the survey. Whether or not you take part is up to you. You can choose not to take part. You can agree to take part now and change your mind later. If you decide to not be
5. Who can you talk to about this research study? If you have questions, concerns, or complaints, or think the research has hurt you, you can talk to the research team (Daisy Mullasery) at dgm27@drexel.edu. This research has been reviewed and approved by an Institutional Review Board (IRB). An IRB reviews research projects so that steps are taken to protect the rights and welfare of human subjects taking part in research. You may talk to them at (215) 255-7857 or email HRPP@drexel.edu for any of the following: Your questions, concerns, or complaints are not being answered by the research team. You want to talk to someone besides the research team. You have questions about your rights. You want to get information or provide input about this research.

6. Why are we doing this research? We would like to find out about your opinion as an Asian Indian parent about giving the HPV vaccine compared to the Hepatitis B vaccine to your daughter. We would also like to find out if your health beliefs and your cultural identity have a relationship to your opinion.

7. How long will the research last? It will take about 20 minutes for you to finish this survey. We will ask you questions about whether you live in the US, your age, gender, education, marital status, religion and how many children you have between the ages of 8 and 16 years. We will also ask you your opinion about HPV vaccination, and your cultural identity. The survey has 67 questions plus 5 open-ended questions where you can freely write down your opinions. There are no right or wrong answers to these questions.

8. How many people will be studied? We expect about 160 participants in the study.

9. What happens if I say yes, I want to be in this research? We will ask you to complete the survey.

10. What are my responsibilities if I take part in this research? If you consent to take part in this research, you will complete the survey.

11. What happens if I do not want to be in this research? You may decide not to take part in the research at any point and it will not be held against you.

12. What happens if I say yes, but I change my mind later? If you agree to take part in the research now and stop at any time it will not be held against you.

13. Is there any way being in this study could be bad for me? There is no known risk for being in this study. We will not be collecting information that will identify you; so your answers will be kept private.

14. Do I have to pay for anything while I am on this study? There is no cost to you for participating in this study.

15. Will being in this study help me anyway? We cannot promise any benefits to you or others from your taking part in this research. However, possible benefits may include learning new and interesting information about HPV, available vaccination, and possible advantages and disadvantages of obtaining HPV vaccination for your children.

16. What happens to the collected information? We will not collect any information that can lead back to you directly. Organizations that may inspect your survey and information include the IRB and other representatives of the University who are directly involved with this study. If you would like to enter a lucky draw for a gift card, please enter your email ID in the provided weblink, after completing the survey. The link where you will leave your email ID has no connection to the original survey link.

17. What should I do if I want to be in the study? You can print and keep a copy of the document. You will click on the study link only if you agree to be in the study. By clicking on the study link you are saying: You agree to be in the study. You read the information in this document.
and have no more questions. If you are interested in participating in this study, please consent to the study by clicking "yes". This will take you to the study directly. This research is conducted by a doctoral student (Daisy Mullasery) at Drexel University in Philadelphia. Her supervising Professor is Dr. Barbara Posmontier.

Q4 Do you consent to the terms above?
☐ Yes (1)
☐ No (2)

Q5 SECTION I - QUESTIONS ABOUT YOU, YOUR FAMILY, AND YOUR BACKGROUND

Q6 Do you currently live in the United States?
☐ Yes (1)
☐ No (2)

Q7 What is your gender?
☐ Male (1)
☐ Female (2)

Q8 What is your age (years)

Q9 How long have you spent in school? (please include the total number of years of your education)

Q10 Marital status
☐ Single (1)
☐ Married (2)

Q11 What is your approximate Annual household income (Please report adjusting to the closest thousand)
☐ Less than 50,000 (1)
☐ 50,000 – less than 75,000 (2)
☐ 75,000 – less than 100,000 (3)
☐ 100,000 – less than 125,000 (4)
☐ 125,000 – Less than 150,000 (5)
☐ 150,000 or more (6)

Q12 Do you have some form of health Insurance?
☐ Yes (1)
☐ No (2)

Q13 What is your religious affiliation (check one)
☐ Christian (1)
☐ Hindu (2)
☐ Muslim (3)
☐ Other (4)
Q14 How many children between the ages of 9 to 16 years live in your house?
- One (1)
- Two (2)
- Three (3)
- Four (4)
- Five (5)
- Six or more (6)

Q15 SECTION II – THE FOLLOWING QUESTIONS ASK ABOUT YOUR CHILD/CHILDREN’S AGE, GENDER, AND IMMUNIZATION STATUS. These questions are meant for your child/children between the age group of NINE TO SIXTEEN years. Please start with your oldest child in this age group

Q16 Hepatitis B vaccination and HPV vaccination information

<table>
<thead>
<tr>
<th></th>
<th>Age</th>
<th>Gender</th>
<th>Hep B Vaccine</th>
<th>HPV Vaccine</th>
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</thead>
<tbody>
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<td>(1) (2) (3) (0)</td>
<td>(1) (2) (3) (0)</td>
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<tr>
<td>Child #2 (2)</td>
<td></td>
<td></td>
<td>(1) (2) (3) (0)</td>
<td>(1) (2) (3) (0)</td>
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<tr>
<td>Child #3 (3)</td>
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<td></td>
<td>(1) (2) (3) (0)</td>
<td>(1) (2) (3) (0)</td>
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<tr>
<td>Child #4 (4)</td>
<td></td>
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<td>(1) (2) (3) (0)</td>
<td>(1) (2) (3) (0)</td>
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<tr>
<td>Child #5 (5)</td>
<td></td>
<td></td>
<td>(1) (2) (3) (0)</td>
<td>(1) (2) (3) (0)</td>
</tr>
</tbody>
</table>
Q17 If your children have not received HPV vaccination yet, are you planning on vaccinating against HPV?
- Definitely not (1)
- Probably not (2)
- Yes probably (3)
- Yes definitely (4)
- Not applicable (5)

Q18 In your opinion, what would be the preferred age range for HPV vaccination?
- 8 – 10 years (1)
- 11 – 13 years (2)
- 14 – 16 years (3)
- 17 years or above (4)
- Vaccination is not needed at any age. (5)

Q19 SECTION III – THIS SECTION ASKS YOU ABOUT YOUR BELIEFS ABOUT HPV VACCINATION.

Q20 Please answer the following questions keeping your youngest child between ages of 9-16 years in mind. For each of these questions, please mark ONE response that best describes your belief.
<table>
<thead>
<tr>
<th>Cervical cancer is a deadly disease (1)</th>
<th>Strongly Disagree (1)</th>
<th>Disagree (2)</th>
<th>Neither Agree nor Disagree (3)</th>
<th>Agree (4)</th>
<th>Strongly Agree (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe that cervical cancer is serious (2)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I believe that cervical cancer has serious consequences (3)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I believe that cervical cancer can be extremely harmful (4)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I believe that HPV can be extremely harmful (5)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Getting the HPV vaccine is a good way to protect my child (6)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I worry that my child will get infected with HPV (7)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I worry that my child will get infected with Hepatitis B (8)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Statement</td>
<td>Option 1</td>
<td>Option 2</td>
<td>Option 3</td>
<td>Option 4</td>
<td>Option 5</td>
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<tr>
<td>I worry that my child will get a sexually transmitted disease someday.</td>
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<tr>
<td>It is possible that my daughter will get cervical cancer in the future</td>
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<tr>
<td>My daughter may one day be at risk of getting cervical cancer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I believe that my daughter will get cervical cancer one day</td>
<td></td>
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<tr>
<td>It is likely that my daughter will get HPV one day</td>
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<tr>
<td>My daughter may one day be at risk for getting HPV</td>
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</tr>
<tr>
<td>Having the HPV vaccination might make girls more likely to have sex</td>
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<tr>
<td>Girls who have had the HPV vaccine would be more likely to have unprotected sex (16)</td>
<td></td>
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<tr>
<td>-------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Girls who have had the HPV vaccine would be more likely to have sex at an earlier age (17)</td>
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<tr>
<td>Newly available vaccinations can be dangerous (18)</td>
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<tr>
<td>I would be very worried about side effects of HPV vaccination (19)</td>
<td></td>
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<tr>
<td>I don’t want to give my child too many vaccines (20)</td>
<td></td>
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<tr>
<td>Shots (injections) are extremely painful to my child (21)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Getting shots is really scary for my child (22)</td>
<td></td>
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</tbody>
</table>
A vaccine against HPV could prevent future problems for my child (23)
A vaccine against HPV could benefit both men and women (24)
Having genital warts makes it really hard to find a sexual partner (25)

Q21 SECTION IV – THIS SECTION IS ABOUT THE IMPORTANCE OF OTHERS OPINION TO YOU ABOUT HPV VACCINATION Please answer the following questions keeping your youngest child between ages of 9-16 years in mind. For each of these questions please mark ONE response that best describes your opinion

Q22 How important is it to you that the following people agree with your decision to vaccinate your child?

<table>
<thead>
<tr>
<th></th>
<th>Not important at all (0)</th>
<th>Somewhat unimportant (1)</th>
<th>Not sure (2)</th>
<th>Somewhat important (3)</th>
<th>Extremely important (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your spouse/partner</td>
<td></td>
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<tr>
<td>Your child’s siblings</td>
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<tr>
<td>Your friends</td>
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<tr>
<td>Your child’s physician</td>
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<tr>
<td>Other family members</td>
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</tbody>
</table>
Q23 Most people I know think it is a good idea to get children the HPV vaccination before they are teenagers
  - Yes (1)
  - No (2)

Q24 Generally I do what my child’s doctor recommends
  - Yes (1)
  - No (2)

Q25 To your knowledge, have you, or anyone close to you ever had an abnormal pap smear
  - Yes (1)
  - No (2)

Q26 To your knowledge, have you, or anyone close to you ever had cervical cancer?
  - Yes (1)
  - No (2)

Q27 To your knowledge, have you, or anyone close to you ever had a sexually transmitted disease?
  - Yes (1)
  - No (2)

Q28 To your knowledge, have you, or anyone close to you ever had genital warts?
  - Yes (1)
  - No (2)

Q29 If given an option, whom would you prefer to vaccinate more readily?
  - Your daughter/daughters (1)
  - Your son/sons (2)
  - The gender of the child is not a significant factor in my decision (3)

Q30 If both Hepatitis B vaccine and HPV vaccine were offered at birth/infancy, which vaccine/vaccines would you accept?
  - Both vaccines (1)
  - Hepatitis B Vaccine only (2)
  - HPV vaccine only (3)
  - Neither (4)

Q31 Please explain your reasoning for your answer choice for the question above

Q32 What are your thoughts about your child’s vulnerability to acquire Human Papillomavirus in lifetime?

Q33 If you already have vaccinated or will be vaccinating your child against HPV, what are your reasons?

Q34 If you haven’t vaccinated already or will not be vaccinating your child against HPV, what are your reasons?

Q35 What effects do your culture, ethnicity, and religious beliefs have on acceptance or non-acceptance of HPV vaccine?
Q36 What language can you speak?
- Asian only (for example, Indian languages, Chinese, Japanese, Korean, Vietnamese, etc.) (1)
- Mostly Asian, some English (2)
- Asian and English about equally well (bilingual) (3)
- Mostly English, some Asian (4)
- Only English (5)

Q37 What language do you prefer?
- Asian only (for example, Indian Languages, Chinese, Japanese, Korean, Vietnamese, etc.) (1)
- Mostly Asian, some English (2)
- Asian and English about equally well (bilingual) (3)
- Mostly English, some Asian (4)
- Only English (5)

Q38 How do you identify yourself?
- Oriental (1)
- Asian (2)
- Asian-American (3)
- Asian-Indian, Chinese-American, Japanese-American, Korean-American, etc. (4)
- American (5)

Q39 Which identification does (did) your mother use?
- Oriental (1)
- Asian (2)
- Asian-American (3)
- Asian-Indian, Chinese-American, Japanese-American, Korean-American, etc. (4)
- American (5)

Q40 Which identification does (did) your father use?
- Oriental (1)
- Asian (2)
- Asian-American (3)
- Asian-Indian, Chinese-American, Japanese-American, Korean-American, etc. (4)
- American (5)

Q41 What was the ethnic origin of the friends and peers you had, as a child up to age 6?
- Almost exclusively Asians, Asian-Americans, Orientals (1)
- Mostly Asians, Asian-Americans, Orientals (2)
- About equally Asian groups and Anglo groups (3)
- Mostly Anglos, Blacks, Hispanics, or other non-Asian ethnic groups (4)
- Almost exclusively Anglos, Blacks, Hispanics, or other non-Asian ethnic groups (5)

Q42 What was the ethnic origin of the friends and peers you had, as a child from 6 to 18?
- Almost exclusively Asians, Asian-Americans, Orientals (1)
- Mostly Asians, Asian-Americans, Orientals (2)
- About equally Asian groups and Anglo groups (3)
- Mostly Anglos, Blacks, Hispanics, or other non-Asian ethnic groups (4)
- Almost exclusively Anglos, Blacks, Hispanics, or other non-Asian ethnic groups (5)
Q43 Whom do you now associate with in the community?
- Almost exclusively Asians, Asian-Americans, Orientals (1)
- Mostly Asians, Asian-Americans, Orientals (2)
- About equally Asian groups and Anglo groups (3)
- Mostly Anglos, Blacks, Hispanics, or other non-Asian ethnic groups (4)
- Almost exclusively Anglos, Blacks, Hispanics, or other non-Asian ethnic groups (5)

Q44 If you could pick, whom would you prefer to associate with in the community?
- Almost exclusively Asians, Asian-Americans, Orientals (1)
- Mostly Asians, Asian-Americans, Orientals (2)
- About equally Asian groups and Anglo groups (3)
- Mostly Anglos, Blacks, Hispanics, or other non-Asian ethnic groups (4)
- Almost exclusively Anglos, Blacks, Hispanics, or other non-Asian ethnic groups (5)

Q45 What is your music preference?
- Only Asian music (for example, Indian, Chinese, Japanese, Korean, Vietnamese, etc.) (1)
- Mostly Asian (2)
- Equally Asian and English (3)
- Mostly English (4)
- English only (5)

Q46 What is your movie preference?
- Asian-language movies only (1)
- Asian-language movies mostly (2)
- Equally Asian/English English-language movies (3)
- Mostly English-language movies only (4)
- English-language movies only (5)

Q47 What generation are you? (Mark the generation that best applies to you)
- 1st Generation = I was born in Asia or country other than U.S. (1)
- 2nd Generation = I was born in U.S., either parent was born in Asia or country other than U.S. (2)
- 3rd Generation = I was born in U.S., both parents were born in U.S., and all grandparents born in Asia or country other than U.S. (3)
- 4th Generation = I was born in U.S., both parents were born in U.S., and at least one grandparent born in Asia or country other than U.S. and one grandparent born in U.S. (4)
- 5th Generation = I was born in U.S., both parents were born in U.S., and all grandparents also born in U.S. (5)

Q48 Where were you raised?
- In Asia only (1)
- Mostly in Asia, some in U.S. (2)
- Equally in Asia and U.S. (3)
- Mostly in U.S., some in Asia (4)
- In U.S. only (5)
Q49 What contact have you had with Asia?
- Raised one year or more in Asia (1)
- Lived for less than one year in Asia (2)
- Occasional visits to Asia (3)
- Occasional communications (letters, phone calls, etc.) with people in Asia (4)
- No exposure or communications with people in Asia (5)

Q50 What is your food preference at home?
- Exclusively Asian food (1)
- Mostly Asian food, some American (2)
- About equally Asian and American (3)
- Mostly American food (4)
- Exclusively American food (5)

Q51 What is your food preference in restaurants?
- Exclusively Asian food (1)
- Mostly Asian food, some American (2)
- About equally Asian and American (3)
- Mostly American food (4)
- Exclusively American food (5)

Q52 Do you
- Read only an Asian language? (1)
- Read an Asian language better than English? (2)
- Read both Asian and English equally well? (3)
- Read English better than an Asian language? (4)
- Read only English? (5)

Q53 Do you
- Write only an Asian language? (1)
- Write an Asian language better than English? (2)
- Write both Asian and English equally well? (3)
- Write English better than an Asian language? (4)
- Write only English? (5)

Q54 If you consider yourself a member of the Asian group (Oriental, Asian, Asian-American, Chinese-American, etc., whatever term you prefer), how much pride do you have in this group?
- Extremely proud (1)
- Moderately proud (2)
- Little pride (3)
- No pride but do not feel negative toward group (4)
- No pride but do feel negative toward group (5)

Q55 How would you rate yourself?
- Very Asian (1)
- Mostly Asian (2)
- Bicultural (3)
- Mostly Westernized (4)
- Very Westernized (5)
Q56 Do you participate in Asian occasions, holidays, traditions, etc.?
- Nearly all (1)
- Most of them (2)
- Some of them (3)
- A few of them (4)
- None at all (5)
EFFECT OF HEALTH BELIEFS AND ACCULTURATION ON HPV

APPENDIX C - IRB Approval - Drexel University

Drexel UNIVERSITY
Office of Research

APPROVAL OF PROTOCOL

July 24, 2015

Barbara Posmontier, PhD, CNM,
PMHNP-BC College of Nursing
and Health Professionals
Mailstop: 1030

Dear Dr. Posmontier:

On July 24, 2015 the IRB reviewed the following protocol:

<table>
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<th>Type of Review:</th>
<th>Initial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title:</td>
<td>Effect of Health Beliefs and Acculturation on HPV Vaccine Acceptance among Asian Indian Parents</td>
</tr>
<tr>
<td>Investigator:</td>
<td>Barbara Posmontier, PhD, CNM, PMHNP-BC</td>
</tr>
<tr>
<td>IRB ID:</td>
<td>1506003740</td>
</tr>
<tr>
<td>Funding:</td>
<td>Internal</td>
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<tr>
<td>Grant Title:</td>
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<td>Grant ID:</td>
<td>None</td>
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<tr>
<td>IND, IDE or HDE:</td>
<td>None</td>
</tr>
<tr>
<td>Documents Reviewed:</td>
<td>Proposal Transmittal Form, HRP 201 Contact Forms, Conflict of Interest Forms, HRP-211, HRP-503 Template Protocol, Consent Script, Data Collection Tools, Recruitment Flyer, Permission Letters, and Proposal</td>
</tr>
</tbody>
</table>

According to 45 CFR 46, 110, this study is Approved Expedited Category 7. This study will enroll 160 subjects recruited from community sites in Houston, including Asian Indian associations and cultural organizations, local Hindu Temples, Christian churches, and Muslim mosques to complete surveys.

According to 45 CFR 46.1 17(c), this protocol has been approved with a Waiver of Written Documentation of Consent and Alteration of the Consent Process.
The IRB approved the protocol from July 24, 2015 to July 23, 2016 inclusive.

Before June 8, 2016, which is 45 days prior to study closure, you are to submit a completed "FORM: Continuing Review Progress Report (HRP-212)" and required attachments to request continuing approval or closure.

Continuing review approval is not granted before the expiration date of July 23, 2016, approval of this protocol expires on that date.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Teresa C Hinton
Member, Social and Behavioral IRB #3
Appendix D - IRB Approval - UT Health Science Center Houston

Daisy Mullassery

UT-H - SN - Department of Family Health July 31, 2015

HSC-SN-15-0612 - Effect of Health Beliefs and Acculturation on HPV Vaccine Acceptance among Asian Indian Parents

The above named project is determined to qualify for exempt status according to 45 CFR 46.101(b)

**CATEGORY #2:** Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:

a. information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; AND,

b. any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

(NOTE: The exemption under Category 2 DOES NOT APPLY to research involving survey or interview procedures or observation of public behavior when individuals under the age of 18 are subjects of the activity except for research involving observations of public behavior when the investigator(s) do not participate in the activities being observed.)

**CHANGES:** Should you choose to make any changes to the protocol that would involve the inclusion of human subjects or identified data from humans, please submit the change via iRIS to the Committee for the Protection of Human Subjects for review.

**STUDY CLOSURES:** Upon completion of your project, submission of a study closure report is required. The study closure report should be submitted once all data has been collected and analyzed.

Should you have any questions, please contact the Office of Research Support Committees at 713-500-7943.
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<tr>
<td>Registered Company #</td>
<td>1982084</td>
</tr>
<tr>
<td>Customer name</td>
<td>Daisy Mullassery</td>
</tr>
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| Licensed content author| Diane Reynolds, Kathleen A. O'Connell |
| Licensed content date  | December 2012       |
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| Portion                | figures/tables/illustrations |
| Number of figures/tables/illustrations | 1 |
| Format                 | both print and electronic |
Letter of Permission - Dr. Marlow

Marlow, Laura [l.marlow@ucl.ac.uk]

In response to the message from Wardle, Jane, 3/9/2015
To: Wardle, Jane [j.wardle@ucl.ac.uk]; Mullassery, Daisy G
Attachments: Download all attachments
Parental views on vaccinat~1.pdf (12 KB) [Open as Web Page]; Parental views on vaccinat~2.pdf (97 KB)[Open as Web Page]

Dear Daisy,

I'm terribly sorry, I do not recall seeing your emails.

I have attached the questionnaire that we used as well as a file indicating where the items originated from. There are superscript numbers in the questionnaire that relate to the references in the items file. Please feel free to use the questionnaire as you consider best.

Kind Regards,
Laura.
Letter of Permission - Dr. Dempsey

Dempsey, Amanda [AMANDA.DEMPSEY@UCDENVER.EDU]

In response to the message from Mullassery, Daisy G, 11/11/2014

To: Mullassery, Daisy G

Attachments: PEARSON REAL.pdf (325 KB)[Open as Web Page]

You replied on 11/13/2014 10:01 AM.

Hi Daisy - thanks for your email. It looks like you contacted me once before in August and I thought that I replied. If not, my apologies. Here is the survey from the study, though many of the questions are not somewhat out of date.

Best of luck with your study. Please reference this work if you decide to use any of the questions verbatim.

Sincerely,

Mandy Dempsey, MD, PhD, MPH
Children's Outcomes Research Program
University of Colorado Denver
13199 E. Montview Blvd, Suite 300
Aurora, CO 80045
303-724-6679